FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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CONTENTS.

With regard to photographs and descriptions of new British machines and those of our Allies, and other information which may be of help to our enemies, it should be noted that the Editor of FLIGHT, *in the National interest, submits all matter of this character to the Official Press Censor before publication. Hence our readers will appreciate that many new departures in construction or advances in detail work are necessarily held back for the present rather than the smallest risk should be run of helping those who are so strenuously fighting the Allies for the enforcement of their "Kultured" militarism.*—ED.

EDITORIAL COMMENT.

Germany's Airfleet on its Trial.

It was only last week that in the course of an article on German aircraft and this country we referred to the recent stagnation of the enemy's airships, so far as visiting England was concerned. Curiously, at the moment when FLIGHT was on the press this inactivity was being broken, as details of the raids upon Tyneside towns, and later the visits of airships to the East coast, and an aeroplane to Kent, were being spread broadcast by the daily press. Taking into consideration the period of the year, these visits were only what was to be expected, as if effective work is not forthcoming now and within the approaching weeks, the much-vaunted mission of the German airfleet, like its naval prototype, will, indeed, have to be written down a fraud. Simply, however, because little or no damage was done during these excursions, it would be unwise to label them as complete fiascos. We have to regard the results as far as possible through German eyes and apply the moral to ourselves. It is plainly evident that, if any really hair-raising attack is to be made primarily upon London, by way of ramming home upon Britishers the moral effect of actual bombardment, the attackers must have the experience necessary, both in respect of air navigation and geography, to justify the huge risks entailed in sending across a fleet of their airships in such numerical strength as to ensure effective work being carried to its conclusion. We are strongly of opinion, therefore, that the recent visits and other tentative essays since reported from eastwards are mere trials, being carried out under war conditions, to educate and inform the crews in charge of the aircraft. These crews are undoubtedly all picked men, and by this means they are rapidly gaining the necessary navigating experience to enable them to lead a fleet or fleets of airships across the seas, with sufficient accuracy to ensure the maximum of effect being obtained in the minimum of time subject to such little interferences as may arise from atmospheric conditions and our defensive organisation. This being so, we are inclined to accept the dropping of the bombs indiscriminately during the recent visits as merely incidental to this main object. That they must have some sort of moral effect in the surrounding neighbourhood favoured is perhaps rightly held by the Staff of the German air services. That the actual effect is much more than a momentary fright to those immediately concerned, the destruction of some live stock and the means of further adding to the profits of the insurance circle which is exploiting the more timid section of the public, is to be very much doubted. But for what it is worth, the throwing of the bombs is put down by the Huns as part of their programme of "frightfulness" which may usefully be indulged in. One effect, which is not a set part of the German programme, however, is that each attack of this character undoubtedly gives a further fillip to the recruiting campaign which is in such active progress throughout the country, whilst the alarms afford an excellent opportunity for the authorities to test, by emergency calls, the organisation of the special constables and the anti-aircraft corps.

That Count Zeppelin and his staff have every intention of promoting a massed visit to London in the near future may be accepted as certain. Irrespective of what may thereby be accomplished, they have no choice in the matter, if their reputations and boasts are in any way to be upheld. The peoples of Germany have been so saturated by anticipation, with the paralysing effects which are to be brought about by the carrying out of a murderous programme, by means of their destruction-dealing dirigibles, that it has now become imperative that a showing of some sort shall be made to justify the large expenditure incurred, and to fulfil the great promises which have, up to now, been held forth as leading up to the climax of England's downfall. There is little question that Germany is deeply disappointed at the practical failure, so far, of her airfleet. It is so utterly at variance with the expectations which have been engendered by those who have held that mammoth dirigibles carrying tons of explosives were to be the deciding factor in this war of nations. They are to be nothing of the sort, but they may nevertheless be a source of unpleasant happenings which, however, in the light of the awfulness of the slaughter at the front, day in and day out, will be but as a grain of sand when regarded in correct focus with the war as a whole.

One very important point should not be missed. In the recent visits, all the known facts point strongly to the probability that the pilots had lost their bearings both up north and during the Essex raid. In throwing their bombs upon Maldon there can be little doubt, in spite of German explanations to the contrary, they thought they were aiming at a totally different objective. In the final result, they have no means of knowing how far they were out in their reckoning and where they went astray, except from information supplied through reports and satetments from this side. And the pity of it all. We are not too enamoured of some of the procedure of the Censor's department, although fully acknowledging the importance of such a corrective to irresponsible publication of "news," but if there be any justification for this department's existence, it should surely take steps to see that all details of places affected and localities visited by these aircraft should be most carefully suppressed. It is only by this means that the "experience" which is sought by the dirigible pilots can be countered, and be their excursions never so many, they will probably still remain as ill-informed of how to recognise their whereabouts from above, and thus, when at last "the day" (or night) arrives for the epoch-making attack upon England's metropolis, the whole adventure must be necessarily largely guesswork, and as likely as not, with all lights out, they may expend their fury harmlessly upon unfortified fields and spaces before they are checked by our own ground anti-aircraft organisation and our fleet of aeroplanes.

This sort of air piracy, however, is not war; it is but a shadow of the real thing. It must, nevertheless, be persisted in by the German Staff for the delectation of their own people, but it has no military significance and advances its perpetrator not one iota nearer to victory.

The Flying Services Fund.

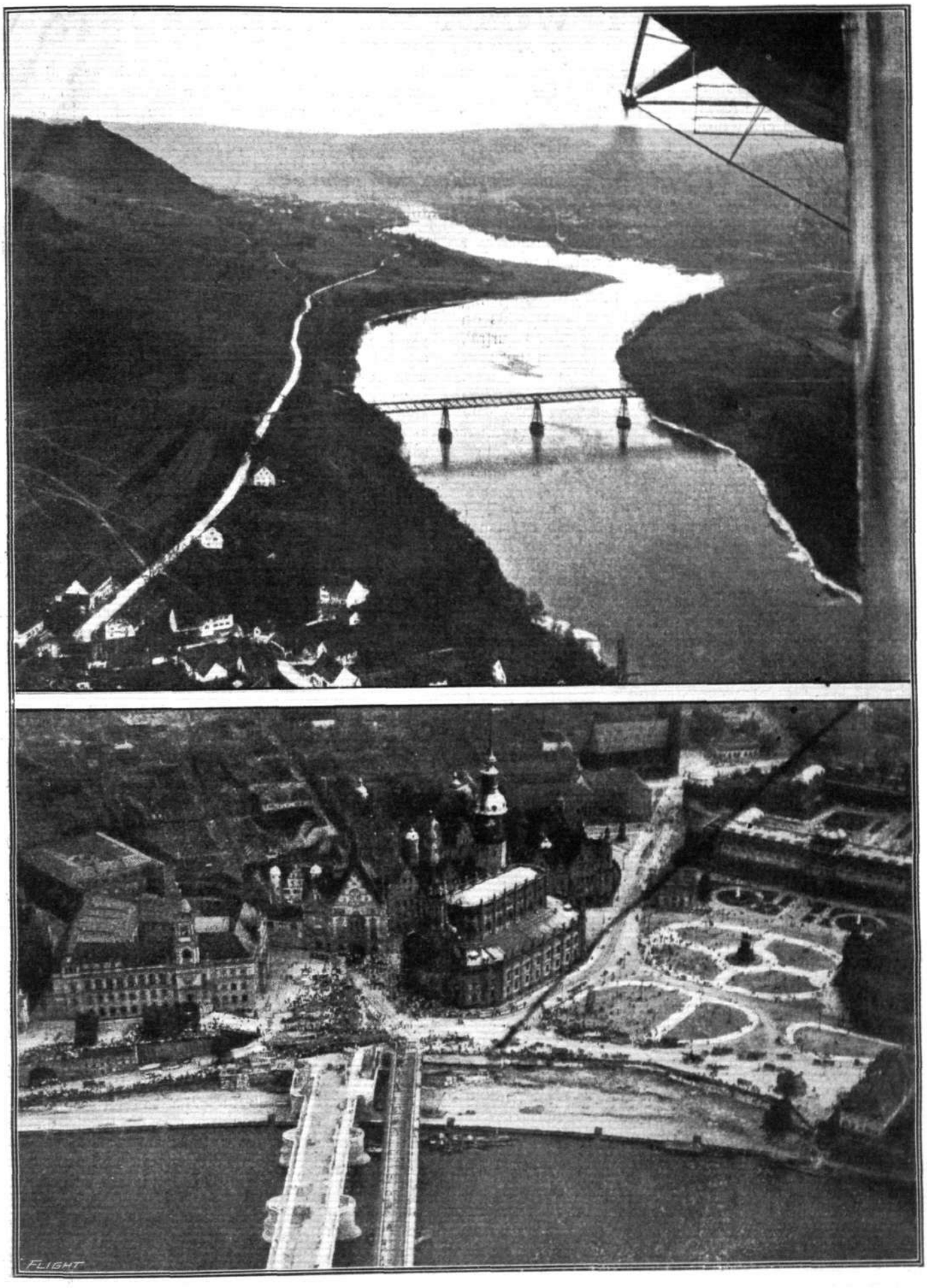
At the risk of appearing too persistent, we again venture to draw attention to the Flying Services Fund which is under the administration of the Royal Aero Club. At the time it was launched there were a few who were somewhat sceptical as to the need for such a fund, but having regard to the daily increasing activity of our aircraft services, we should imagine that the few who were of this mind have now been converted. One feature in the remarkable work that is being done by our flying officers is the widespread area over which it is being conducted. As a fact, it will be remembered that the operations that are taking place in France and Flanders form but one section—a vastly important one, truly—of the activities, as witness the reports regarding the all-important aid given by the Flying Services in the Dardanelles, in Egypt, and other parts of the world that are affected by the war.

Furthermore, although our flying officers, whether attached to the Navy or the Army, have so far been wonderfully immune from disaster, it cannot be expected that amidst all the dangers that are being faced such a fortunate state of things can continue with them and the other ranks of the Air Service to the end. Happily, the list of casualties in connection with our aircraft services has so far been relatively small. The war is, however, in the opinion of many, far from being over, and therefore it is to be expected that further additions will be made to the list ere the final victory is secured. Hence it is incumbent to see that every effort is forthcoming to ensure every possible impetus being given to swell the Fund, the object of which is to benefit those men who are incapacitated while on active service, and to help the wives and dependants of those who give their lives in the service of their country.

To be quite frank, although a sum of over £8,000 has been collected, the rate of progress in anything but a credit to the nation. It has taken approximately four months to collect this amount, the bulk of which has, moreover, been contributed by those directly concerned with, or interested in, aviation. What we should like to see is some active interest taken outside the comparatively limited circle of aeronautics to bring the Fund to a level worthy of its objects, and more in keeping with the almost unappreciable value of the services which the Fifth Arm has given to the nation in this war. It is full time that the public should loosen their purse-strings in the direction of the Flying Services Fund, and swell the total available for the helpful work which it will assuredly be called upon to perform, to a figure more in keeping with the prodigious value which aircraft have attached to themselves as a huge national asset. It is difficult to know how best to bring this patent fact home to the public, where so many funds are crying aloud for support, but it is essential that some drastic steps should be taken to induce a more general recognition of the Flying Services Fund amongst one and all, even if such recognition may, in a degree, reflect detrimentally upon the many funds which, in spite of their seeming claims, have a strongly suspicious atmosphere of self-advertisement, if nothing worse.

To Encourage Aviation in America.

IN view of the increased interest which is now being taken in aviation in the United States, the Aero Club of America is organising a National Aeroplane competition, to begin on Independence Day, July 4th, and end on Columbus Day, October 12th. There will be a daily prize of $100 for the aviator covering the longest distance in ten hours, that being considered a normal flying day, and in addition there will be other prizes for the greatest aggregate distance flown, the best demonstration of mail carrying, the best aeroplane in the competition from the point of view of construction, &c.



POINTS OF INTEREST IN GERMANY, AS SEEN FROM GERMAN AIRSHIPS.—The top photograph shows Stein on the Rhine, as taken from the "Deutschland." Below is a view in Dresden, from a picture taken from "P. VI."

AIRCRAFT WORK AT THE FRONT.

OFFICIAL INFORMATION.

THE following was included in the long despatch from Sir John French published on the 14th inst. :—

"The work of the Royal Flying Corps throughout this period, and especially during the operations of the 10th, 11th, and 12th March, was of the greatest value. Though the weather on March 10th and on the subsequent days was very unfavourable for aerial work, on account of low-lying clouds and mist, a remarkable number of hours' flying of a most valuable character were effected, and continuous and close reconnaissance was maintained over the enemy's front. In addition to the work of reconnaissance and observation of artillery fire, the Royal Flying Corps was charged with the special duty of hampering the enemy's movements by destroying various points on his communications. The railways at Menin, Courtrai, Don and Douai were attacked, and it is known that very extensive damage was effected at certain of these places. Part of a troop train was hit by a bomb, a wireless installation near Lille is believed to have been effectively destroyed, and a house in which the enemy had installed one of his headquarters was set on fire. These afford other instances of successful operations of this character. Most of the objectives mentioned were attacked at a height of only 100 to 150 ft. In one case the pilot descended to about 50 feet above the point he was attacking. Certain new and important forms of activity, which it is undesirable to specify, have been initiated and pushed forward with much vigour and success. There have been only eight days during the period under review on which reconnaissances have not been made. A total of approximately 130,000 miles have been flown—almost entirely over the enemy's lines. No great activity has been shown over our troops on the part of the enemy's aircraft, but they have been attacked whenever and wherever met with, and usually forced down or made to seek refuge in their own lines.

"General Baron Von Kaulbars, of the Russian General Staff, arrived at my Headquarters on March 18th. He was anxious to study our aviation system, and I gave him every opportunity of doing so."

The following was contained in a statement issued by the War Office on Monday night :—

"Yesterday two more German aeroplanes were brought down. In this area, since the 15th instant, the total loss to the enemy is five aeroplanes."

In the despatch from Sir John French dated April 19th, there was the following :—

"The improvement in the weather since my last report has resulted in an increase in the activity of both our own and the enemy's air service. As usual, the advantage in the exchanges has been with us. In the Ypres district four hostile aeroplanes have been brought down in the last three days, two by us and two by the French. Yesterday one of our airmen engaged and drove off three hostile aeroplanes, completing subsequently the reconnaissance on which he was engaged."

In the despatch dated April 13th from an "Eyewitness" present with the British General Headquarters there was the following :—

"The 1st of April," he says, "was not allowed to pass without one practical joke being played on the enemy. An aviator flying over the Lille aerodrome dropped a football. It fell slowly through the air, and the Germans could be seen hurrying from all directions to take cover from what they evidently thought was a bomb. That it bounced to an enormous height from the ground without exploding was probably taken to be due to a 'delay action' fuse, for it was not till the ball finally came to rest that they emerged from their shelters to examine it. On it was written : 'April fool—Gott strafe England.'"

In the despatch dated April 16th from an "Eyewitness" present with the British General Headquarters there was the following :—

"On Monday, the 12th, ... our anti-aircraft guns damaged one of the enemy's aeroplanes, which retired hurriedly.

"About midnight on the night of the 12th-13th an airship passed over one town, where it dropped fifteen bombs, some of considerable size. Three women and a child were killed, and a few horses were injured. It afterwards flew north-west, and dropped more bombs without effecting any damage.

"On the 13th the enemy's aeroplanes were more active, especially east of Ypres, throwing flares and smoke-balls over our trenches, which were then subjected to a heavy bombardment by guns and rifle-grenades."

The following statement was issued in Cairo on Sunday :—

"On the 16th inst, three aeroplanes made a flight from the Canal to El Sirr, some 25 miles south of El Arish, dropping nine bombs, which were effective. About 150 to 200 tents were seen. The distance flown was more than 170 miles. No other enemy's troops were seen this side of El Sirr, though one or two small posts of about 20 men are known to exist.

"On the same date a French cruiser bombarded the camp near El Arish, a seaplane directing her fire. No large number of troops were seen, though the enemy's guns opened fire both on the cruiser and on the seaplane without hitting either of them.

"On the 17th a French cruiser, again assisted by seaplanes, bombarded the enemy's camp well to the south of Gaza town. Considerable damage was caused to the troops."

The following was included in the afternoon *communique* issued in Paris on the 14th inst. :—

"A Zeppelin threw bombs on Bailleul. The aim of the bombs was the flying-ground, which was, however, not struck. Three civilians were killed.

"Two German aeroplanes were forced to descend in our lines, one near Braine and the other near Luneville. The aviators were made prisoners. A third enemy aircraft, which was hit by the fire of our advance posts, fell near Ornes, to the north of Verdun, some 600 mètres from our lines. One of the aviators was struck by a bullet."

In the evening *communique* issued in Paris on the 15th inst., there was the following :—

"A German Aviatik threw bombs on the hospital of Mourmelon. By way of reprisal for the bombardment of Nancy by a Zeppelin, one of our aeroplanes threw five bombs on the German Headquarters. The projectiles all fell on the buildings in which the Imperial Staff is installed at Mézières-Charleville. We also bombarded the station of Freiburg, in Breisgau. Finally, a flying squadron of fifteen machines dropped bombs with complete success on the German military buildings of Ostend. Our aeroplanes were violently cannonaded, but all returned unscathed."

In the afternoon *communique* issued in Paris on the 16th inst., it was stated :—

"Yesterday afternoon our artillery brought down an aeroplane, which fell opposite the British lines, behind the German trenches to the north of Ypres."

In the evening *communique* on the same date there was the following :—

"Our aviators were very active. Ten bombs were dropped on the railway workshops at the station of Leopoldshohe, east of Huningue. These workshops are at present being used for the manufacture of shells. Ten bombs were dropped on the powder magazine at Rothweil. Six struck the mark. A huge red flame shot up, surmounted by dense smoke. The aeroplanes were struck by shell splinters, but returned safe and sound.

"Forty bombs, most of which hit the mark, were dropped on the central electric station of Maisières-les-Metz, fifteen kilometres north of Metz. This station supplies the town and forts of Metz with power and light. Thick smoke rose from the central building. On their return our aviators encountered three Aviatiks, to which they gave chase, forcing them to land. The squadron suffered no mishap, though subjected to a violent cannonade from the Metz forts."

In the evening *communique* on Saturday there was the following :—

"A British aeroplane brought down a German aeroplane in Belgium, near Boesingle. The machine fell within our lines. The pilot was killed and the observer was taken prisoner. One of our dirigibles bombarded the station and the aviation sheds of Freiburg in Breisgau."

In Sunday afternoon's *communique* it was stated :—

"A Belgian aeroplane brought down a German aeroplane near Roulers. In the same region one of our air squadrons successfully bombarded an aerodrome."

In the evening *communique* on the same day there was the following :—

"One of our aeroplanes, after a brilliant pursuit, brought down a German aeroplane, which fell in the enemy lines in Belgium, between Langemarck and Paschendaele."

An official *communique* issued by the Ministry of Marine on Saturday stated :—

"Yesterday a French battleship, while supporting an aeroplane reconnaissance, effectively bombarded enemy works at El Arish, on the northern coast of the Sinai Peninsula, and the concentration of Turkish troops reported around that town."

In the afternoon *communique* issued in Paris on Monday there was the following :—

"The German aeroplanes which flew over Belfort dropped four bombs, which did some damage to two hangars, and set fire to four powder chests. No casualties resulted, and no serious damage of any kind has been done.

"The aviator Garros was forced to come down at Ingelmünster (ten kilometres north of Courtrai), and was made prisoner yesterday evening."

In a *communique* issued in Petrograd on April 17th, there was the following :—

"The activity of the enemy's aeroplanes is particularly manifested in the region of Ostrolenko, Novogrod and Czekhanoff. The enemy's machines operate in flotillas of twelve or fifteen, flying together and throwing as many as 180 bombs on a town or village which they attack, but causing only insignificant damage and never loss of life. Our aviators reply with a smaller number of large bombs."

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BRITISH AIR SERVICES.

UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, *it is not repeated in this column.*

Royal Naval Air Service.

THE following announcement was made by the Admiralty on the 14th inst. :—

C. W. Graham, entered as Probationary Flight Sub-Lieutenant, for temporary service, with seniority of April 12th, and appointed to "President," additional, for R.N.A.S.

The following announcement was made by the Admiralty on the 15th inst. :—

Temporary commissions have been granted as follows :

Lieutenants (R.N.V.R.) : G. E. Knights, to "President," additional, for duty with R.N.A.S. ; April 1st. J. S. Hills, W. S. Prentice, and W. J. Maybery, all to "President," additional, for duty with R.N.A.S. ; to date April 13th.

Sub-Lieutenant (R.N.V.R.) : M. R. Buckland, to "President," additional, for duty with R.N.A.S. April 1st.

The following announcement was made by the Admiralty on the 16th inst. :—

Temporary Lieut.-Commander (R.N.V.R.) The Duke of Westminster, promoted to temporary Commander, with seniority of April 11th.

Temporary Lieuts. (R.N.V.R.) A. F. Smith, Lord Tollemache, and R. W. McGrath, all promoted to temporary Lieutenant-Commander, with seniority of April 12th.

Temporary Sub-Lieuts. (R.N.V.R.) K. Secretan, E. J. B. How, and S. Hedley, all promoted to temporary Lieutenant, with seniority of April 12th.

The following announcement was made by the Admiralty on the 17th inst. :—

The following have been entered as Probationary Flight Sub-Lieutenants, and appointed to "President," additional, for

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Mr. Winston Churchill makes a tour of inspection round the Hendon Aerodrome sheds accompanied by Flight-Com. Grahame-White, Flight-Com. Sitwell, &c.

R.N.A.S.; to date April 16th: S. St. G. C. Belfield (for temporary service), M. A. Osborn, C. L. Scott, E. J. P. Burling, A. R. Cox, C. T. MacLaren, B. P. H. de Roeper, H. C. Vereker, and Chief Petty Officer H. O'Hagan, R.N.V.R.

Chief Petty Officers H. T. Tullock and A. R. Mackenzie granted temporary commissions as Sub-Lieutenants, R.N.V.R., and appointed to the "President," additional, for Anti-Aircraft Corps. To date April 15th.

Temporary Sub-Lieuts. (R.N.V.R.) C. D. Morrison, transferred to R.N.A.S. as Probationary Flight Sub-Lieutenant, and appointed to "President," additional, for R.N.A.S., April 16th; and G. A. Cox, entered as Probationary Flight Sub-Lieutenant, and appointed to "President," additional, for R.N.A.S., temporary commission as Sub-Lieutenant, R.N.V.R., cancelled, April 12th.

The following announcement was made by the Admiralty on the 19th inst.:—

P.O. Mechanic J. S. Wheelwright, promoted to Probationary Flight Sub-Lieutenant, with seniority of April 15th, and appointed to "President," additional, for R.N.A.S.

Royal Flying Corps (Military Wing).

THE following appeared in the *London Gazette* of the 13th:—

Flying Officers to be Flight Commanders.—Capt. G. T. Porter, R.A. March 27th. Lieut. R. M. Vaughan, Royal Inniskilling Fusiliers, and Temporary Captain. March 28th.

Supplementary to Regular Corps.—Second Lieutenants (on probation) confirmed in rank: F. S. Barnwell, E. E. Hodgson. To be Second Lieutenants (on probation). April 1st: F. W. Wright, J. E. Marriott. Date of seniority of Second Lieut. J. P. Inglefield, May 16th, not as stated in *Gazette* of November 28th.

The following appeared in a supplement to the *London Gazette* issued on the 14th inst.:—

The appointment of Lieut. (temporary Capt.) J. Valentine, Special Reserve, as an Equipment Officer, is antedated to Jan. 16th, 1915.

Supplementary to Regular Corps.—Second Lieutenants (on probation) confirmed in their rank: Friedrich L. Scholte, Louis F. R. Fell.

The following appeared in a supplement to the *London Gazette* issued on the 15th inst.:—

Assistant Equipment Officer.—Temporary Second Lieut. Hon. A. J. W. Keppel. April 2nd, 1915.

The following appeared in the *London Gazette* of April 16th:—

Wing-Commander.—Brevet Major John M. Salmond, D.S.O., King's Own (Royal Lancaster Regt.), from a Squadron-Commander, and to be temporary Lieutenant-Colonel. April 13th, 1915.

Flight-Commander.—Capt. Claud A. G. H. L. Farie, Highland Light Infantry, from a Flying Office. April 13th, 1915.

The following appeared in a supplement to the *London Gazette* issued on the 17th inst.:—

Flying Officers.—March 12th, 1915: Second Lieut. G. H. B. McCall, Special Reserve; Second Lieut. G. G. A. Williams, Special Reserve, 5th (Princess Charlotte of Wales's) Dragoon Guards; Lieut. M. D. Methven, 10th (County of London) Batt. London Regt. (Hackney), Territorial Force. March 31st, 1915: Capt. F. W. Smith, 2nd South Midland Brigade, Royal Field Artillery, Territorial Force; temporary Second Lieut. C. E. I. C. Anne, 6th (Service) Batt. King's Own (Yorkshire Light Infantry), and to be transferred to the General List, New Armies.

Equipment Officer.—Lieut. J. T. C. Moore-Brabazon, Special Reserve, from an Assistant Equipment Officer, and to be temporary Captain. March 31st, 1915.

Assistant Equipment Officers.—Second Lieut. L. F. R. Fell, Special Reserve; March 19th, 1915. March 24th, 1915: Second Lieut. F. L. Scholte, Special Reserve; Second Lieut. A. E. Snape, Special Reserve; Second Lieut. H. Burchall, Special Reserve.

Supplementary to Regular Corps.—Second Lieut. (on probation) Harold Burchall is confirmed in his rank. To be Second Lieutenants (on probation): Cecil H. Pixton; April 1st, 1915. George S. Bower; April 12th, 1915.

The following appeared in a supplement to the *London Gazette* issued on the 19th inst.:—

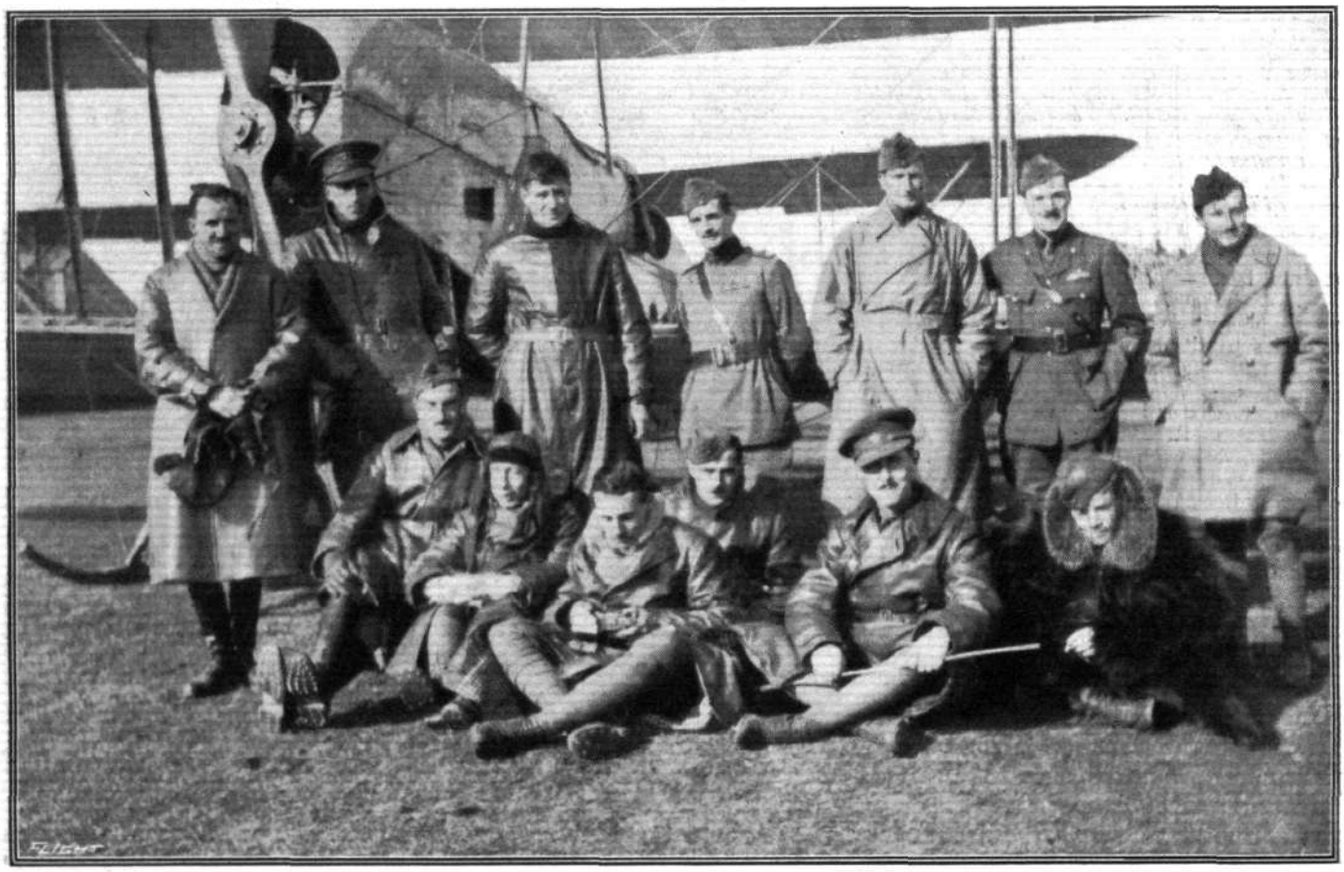
Supplementary to Regular Corps.—Second Lieut. (on probation) Albert E. Snape is confirmed in his rank; Gerald S. Peacock to be Second Lieutenant (on probation); April 19th, 1915.

The following appeared in a supplement to the *London Gazette* issued on the 21st inst.:—

Flight Commander.—Lieut. Reginald P. Mills, Royal Fusiliers (City of London Regt.), from a Flying Officer, and to be temp. Capt. April 10th, 1915.

Flying Officers.—March 27th, 1915: Sec. Lieut. F. S. Barnwell, Special Reserve; Sec. Lieut. W. H. D. Acland, Royal 1st Devon Yeomanry, T.F. April 1st, 1915: Capt. P. Babington, 9th (Cyclist) Batt. Hampshire Regt., T.F.; Temporary Lieut. J. G. Swart, Royal Artillery.

Supplementary to Regular Corps.—To be Second Lieutenants (on probation): March 30th, 1915: Arthur C. Wright, John Gay. Charles J. Chabot; April 1st, 1915. Leonard W. Learmount; April 2nd, 1915. Walter J. B. Curtis; April 16th, 1915.



A group of officers of No. 7 Squadron, R.F.C.

FLIGHT

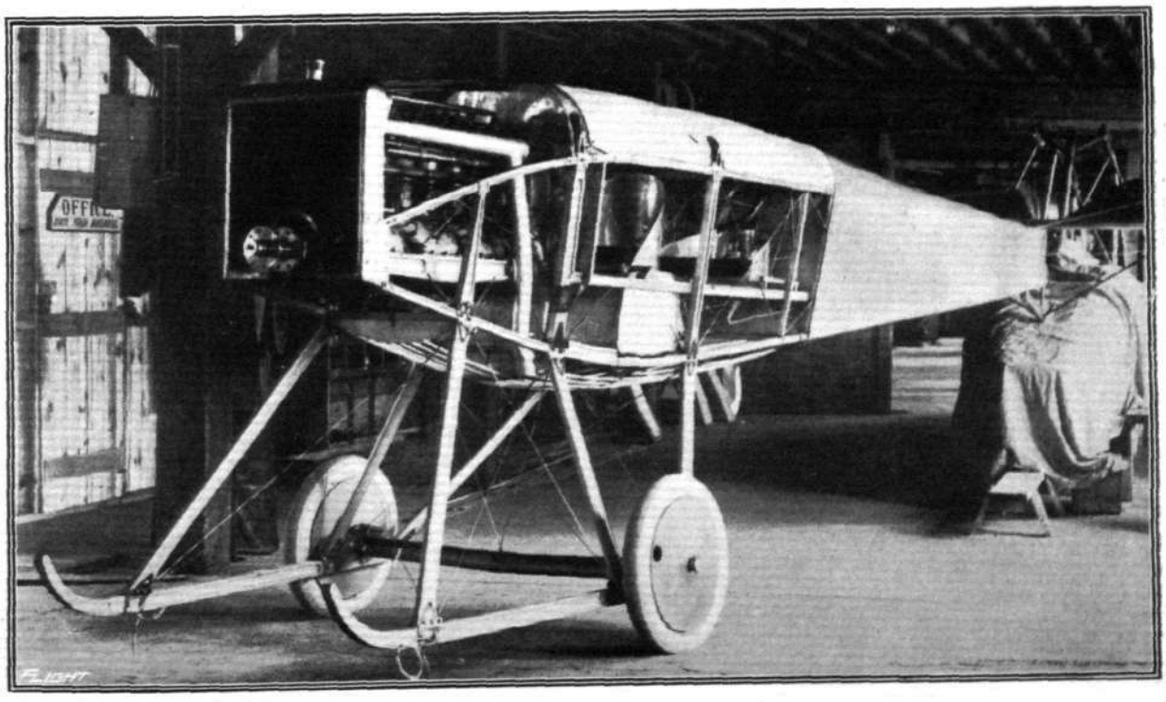
THE THOMAS MILITARY BIPLANE.

One of the several new American machines which have recently been produced, is the tractor biplane, shown in the accompanying illustrations, designed and constructed by Messrs. Thomas Brothers, of Ithaca, N.Y., with a view to meeting the requirements of the U.S. military authorities. Nothing very startling is claimed for this new biplane by its designers, but it is a sound serviceable machine, built on what might be termed standard lines, and incorporating in its construction many novel features. Briefly the Thomas military tractor is a two-seater biplane with a *fuselage* of good streamline form, and fitted with a stationary engine—in the case of the test machines we believe the engine was a 90 h.p. Austro-Daimler. The over-all length is 26 ft., the span 36 ft., chord 5 ft., gap 5 ft.; weight, empty, 1,075 lbs.

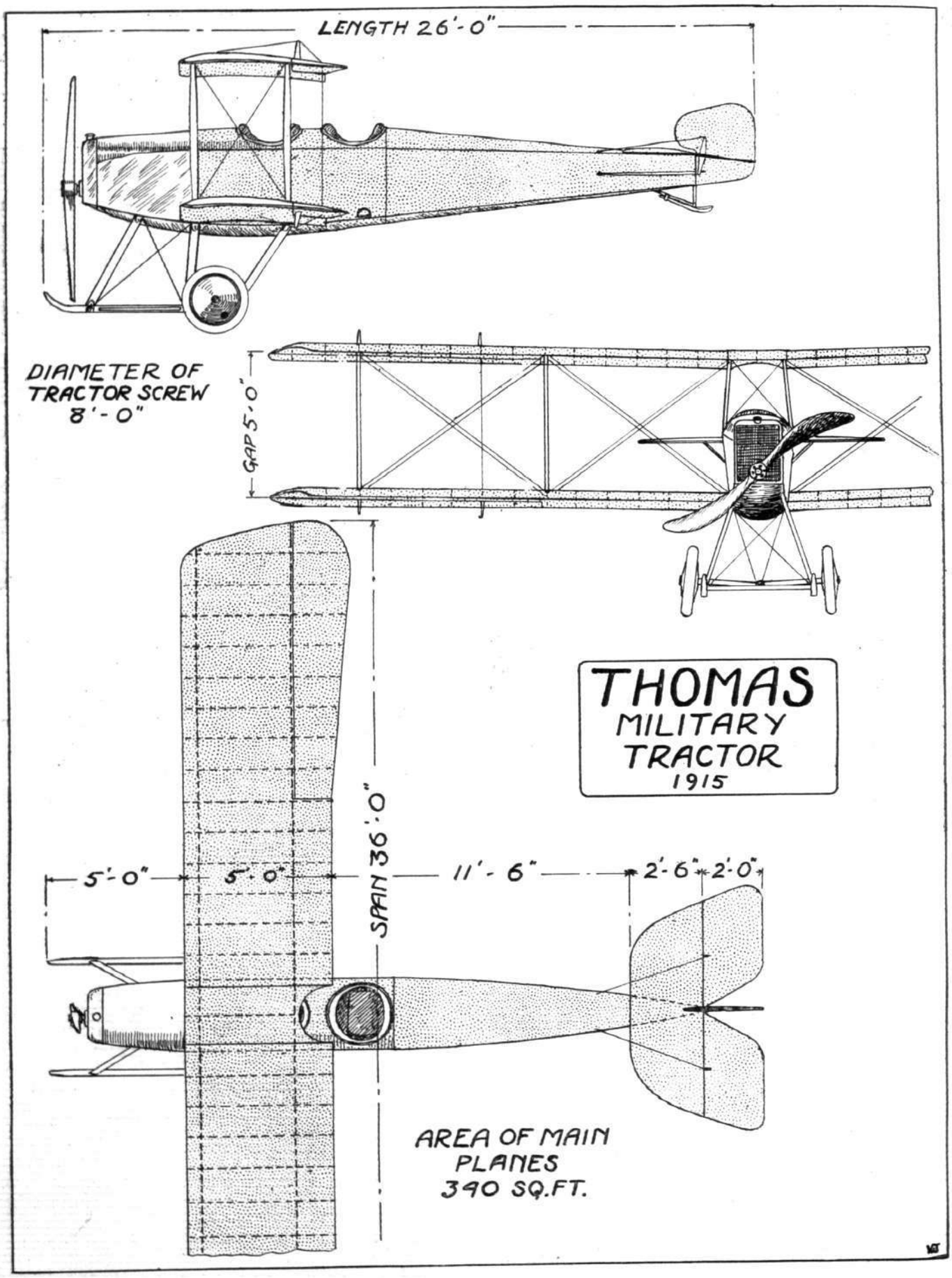
During the test flights the following results were obtained:—

Three-quarter view from the front of the Thomas military tractor biplane.

	U.S. Army Requirements.	Result of Tests.
Speed	70 m.p.h.	81·1 m.p.h.
Useful load ...	750 lbs.	800 lbs.
Climb fully loaded	4,000 ft. in 10 mins.	800 ft. in first min. 4,000 ft. in 10 mins.
Slow speed ...	40 m.p.h.	38 m.p.h.
Propeller efficiency	70 per cent.	75 per cent.



View of the *fuselage* of the Thomas military tractor biplane, showing engine mounting, seating arrangement, and chassis.



THE THOMAS MILITARY BIPLANE.—Plan, side and front elevation.

The full load consisted of pilot, two passengers, and four hours' fuel.

As regards constructional details, the *fuselage*, which is of rectangular section in front, gradually tapering to a section, having its sides sloping inwards, counting from top to bottom, is built up of ash *longerons* connected with spruce struts. Both *longerons* and struts are lightened by being milled out to an I section, and are connected by means of steel plates bolted to the *longerons* in such a manner that the bolts pass through the neutral axis of these members.

In the extreme nose of the *fuselage* is the engine, mounted on two very stout ash bearers, which are in turn carried on two transverse members of the *fuselage*. Immediately in front of the engine is mounted the radiator, which is provided with an opening through which passes the propeller shaft. Behind the engine is a transverse panel, to which is secured the petrol service tank, whence fuel is fed to the engine by gravity. A larger tank containing 20 gallons of petrol rests on the lower *longerons*, and above this main tank is placed the observer's seat. As the fuel in the service tank is consumed, it is replenished from the main tank by means of a hand-operated pump placed in the pilot's cockpit.

To the rear of the observer's seat is a second transverse panel, which serves as an instrument board, with the following instruments let in, so that the dials are flush with the board: Petrol pressure gauge. "Tel" revolution indicator, inclinometer, clock, barograph, air speed indicator, switch, petrol cut-off cock and spark advance lever. The controls in front of the pilot are of the wheel and column type, the wheel operating the rudder, whilst a to-and-fro movement actuates the elevator. Lateral control is at present effected by means of a shoulder yoke operating through flexible cables the double acting *ailerons*, but if desired a more orthodox form of lateral control can be substituted. A turtle back, formed in front by the aluminium bonnet over the engine and in the rear by stringers covered by fabric, tops the *fuselage*, which is also provided with a curved "belly" formed in the same manner as the turtle back.

In front the *fuselage* is enclosed in a covering of light gauge sheet metal, whilst the rear part is covered in the usual way with fabric.

The tail planes, which are built up entirely of steel tubing, consist of the usual members, *i.e.*, a flat, non-lifting stabilising plane—to which the elevator is hinged—and of a partly balanced rudder. A small skid mounted on a continuation of the rudder post protects the tail planes against contact with the ground.

A chassis of the wheel and skid type takes the weight of the machine when on the ground. The two ash skids are carried on six chassis struts of the same wood coming down from the lower *longerons* of the *fuselage*. The first pair of these struts are attached to the *fuselage* approximately under the centre of the engine, and the second pair run to the point where the rear engine bearer is secured to the *fuselage*. The rear pair of struts are attached to the *fuselage* longitudinals at the point where these meet the rear spars of the lower main plane. The stub axles are secured at their inner ends by a pin passing through the two transverse chassis members connecting the skids and between which the axles work. Rubber shock absorbers passing round the axles and secured to the skids provide the necessary springing. Cross wiring of the chassis is effected by stranded cables of ample proportions. The two disc wheels are of 26 ins. diameter, and fitted with 4 in. tyres.

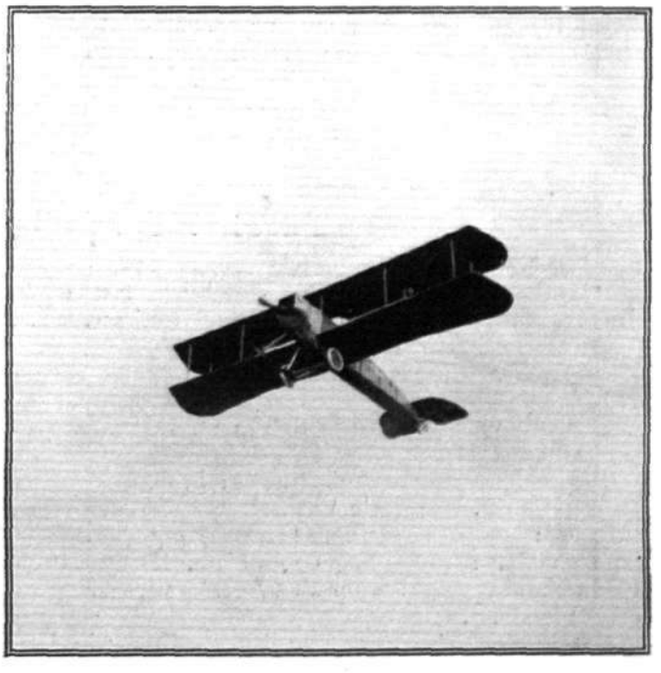
In plan view the main planes are of a form that is rapidly becoming popular with a number of aeroplane designers both in this and other countries, that is to say having their trailing edge slightly longer than the leading edge, a form which is generally considered to minimise end losses. Both upper and lower planes are built in right and left hand pairs, the two halves of the upper plane being attached to a centre section mounted on four short struts coming from the upper longitudinals of the body. In order to give a better view in an upward direction, the trailing edge of this centre section has been cut away.

The wings are built up of silver spruce spars, milled out to an I section, except where are attached the interplane struts. The ribs are also of I section, having thin spruce webs and being fitted with flanges. At the point of attachment of the interplane struts the ribs are of the box type.

All the internal wood-work is painted with a water-proof preparation. The various bays in the wings are internally cross braced with solid steel wire. It is stated by the designers that the factor of safety is nowhere less than 7, which figure is exceeded in many places. Double acting *ailerons* are hinged to both upper and lower planes, so that there should be ample lateral control. In order to render the *ailerons* still more effective, their trailing edge projects some little distance behind that of the main planes.

Special attention has been given to demountability and accessibility of all important parts. Such fittings as wing stay fastenings and strut connections can be very quickly assembled and again taken down.

At their new works at Ithaca, N.Y., to which locality they moved some little time ago, Messrs. Thomas Brothers have facilities for turning out machines at a rate to satisfy Government demands, and on Lake Cayuga a 40-miles stretch of water is available for testing waterplanes, of which this firm have produced several types, while adjoining the lake is a good size aerodrome, where the land machines are put through their trials.



The Thomas military tractor in flight.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Aviators' Certificates.

THE following Aviators' Certificates have been granted :—

1164 2nd Lieut. Alan Murray Waistell (4th Royal Warwickshire Regt.) (Maurice Farman Biplane, Military School, Farnborough). March 24th, 1915.

1165 Flight Sub-Lieut. Colin Johnson, R.N.A.S. (Bristol Biplane, Royal Naval Air Station, Eastbourne). April 11th, 1915.

1166 Flight Sub-Lieut. Cyril Tollemache, R.N.A.S. (Bristol Biplane, Royal Naval Air Station, Eastbourne. April 11th, 1915.

1167 Flight Sub-Lieut. Arthur Charles Teesdale, R.N.A.S. (Short Biplane, Royal Naval Flying School, Eastchurch). April 12th, 1915.

1168 Flight Sub-Lieut. William Henry Wood, R.N.A.S. (Short Biplane, Royal Naval Flying School, Eastchurch). April 12th, 1915.

1169 Commander Frederick Crosby Halahan, R.N. (Maurice Farman Biplane, Royal Naval Air Station, Hendon). April 12th, 1915.

1170 Flight Sub-Lieut. Benjamin Travers, R.N.A.S. (Bristol Biplane, Royal Naval Air Station, Hendon). April 12th, 1915.

1171 Kelham Kirk Horn (Maurice Farman Biplane, Military School, Brooklands). April 15th, 1915.

1172 Flight Sub-Lieut. Francis Joseph Edward Feeny, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). April 15th, 1915.

1173 1st Class Air Mechanic George Leslie Haydon, R.F.C. (Caudron Biplane, Ruffy-Baumann School, Hendon). April 15th, 1915.

1174 Flight Sub-Lieut. George Turner Cain, R.N.A.S. (Bristol Biplane, Royal Naval Air Station, Eastbourne). April 15th, 1915.

THE FLYING SERVICES FUND.

Administered by The Royal Aero Club.

THE Lords Commissioners of the Admiralty and the Army Council having signified their approval, the Royal Aero Club has instituted and will administer a fund originated by M. André Michelin for the benefit of officers and men of the Royal Naval Air Service and the Royal Flying Corps who are incapacitated on active service, and for the widows and dependents of those who are killed.

The fund is intended for the benefit of all ranks, but especially for petty officers, non-commissioned officers and men.

In view of the great utility of the work of the Flying Services, evidence of which has been repeatedly given in the official despatches of the Commander-in-Chief, the skilful and daring flights into enemy country, and the protection afforded by the continuous patrolling of our coast by aircraft, it is confidently expected that the British public will welcome this opportunity of showing their appreciation by subscribing promptly and liberally to the fund.

The Right Hon. Lord Kinnaird has kindly consented to act as Honorary Treasurer to the Fund.

Subscriptions should be forwarded to The Flying Services Fund, The Royal Aero Club, 166, Piccadilly, London, W., or to Barclay and Co., Ltd., 1, Pall Mall East, London, S.W. Cheques should be crossed "Barclay and Co., Ltd."

TULLIBARDINE, Brig.-General,
Chairman of the Royal Aero Club.

	£	s.	d.
Total subscriptions received to April 14th, 1915 ...	7,886	12	2
Ward Room Officers' Mess H.M.S. "Colossus" ...	2	17	6
Miss Morton ...	0	10	0
Per "W."	0	2	6
Employés of Messrs. A. V. Roe & Co., Ltd., for 4 weeks to March 26th, 1915...	26	15	9
Whiteman and Moss, Ltd.	5	5	0
Capt. A. C. Ferguson, A.S.C.	5	0	0
Short Bros., Eastchurch	100	0	0
Sir Kenneth Crossley, Bart.	10	0	0
Henry Armstrong ...	1	1	0
Mrs. E. Archer ...	0	10	6
Albert Jones... ...	50	0	0
Lieut. Robert H. Raikes, R.N. ...	1	1	0
Dr. W. J. S. Lockyer	1	1	0
The Palmer Tyre Ltd.	100	0	0
Miss S. E. Paget Moffatt	1	0	0
Anonymous	10	0	0
S. F.I...	5	0	0
Joseph Owen & Sons, Ltd.	10	0	0
Officers of the Royal Naval Air Station, Isle of Grain ...	8	5	6
Employés of the Cooperage Dept., Royal Victoria Yard, Deptford	5	15	0
British and Colonial Aeroplane Co., Ltd.	250	0	0
Blackburn Aeroplane and Motor Co., Ltd.	5	5	0
E. J. Edwards ...	2	2	0
Mrs. Adam Wilson ...	0	10	0
Total, April 21st, 1915 ...	8,488	13	11

166, Piccadilly, W. B. STEVENSON, Assistant Secretary.

FROM THE BRITISH FLYING GROUNDS.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Monday, last week, straights with instructor: Prob. Flight Sub-Lieuts. Bone, Coleman, and Wain. Solo straights: Prob. Flight Sub-Lieut. Kerby. Circuits: Prob. Flight Sub-Lieuts. Feeney and Jacob.

Wednesday, Prob. Flight Sub-Lieut. De Ville (new pupil) rolling.

Thursday, straights with instructor: Prob. Flight Sub-Lieuts. Coleman and De Ville, Hutchinson and Wain. Circuits: Prob. Flight Sub-Lieuts. Jacob and Potts. Solo straights: Prob. Flight Sub-Lieut. Kerby. Prob. Flight Sub-Lieut. Feeney passed *brevet* tests, making excellent landings.

Beatty School.—The following pupils received instruction during last week :—Messrs. Allcock (55 mins.), Bond (21), Bright (140), Chapelle (30), Cooper (60), Crowe (30), de Meza (5), Faning (15), Fraser (40), Leong (20), Monfea (5), Morgan (5), Pierrot (15), Roche (35), Whincup (5), Wiles (5), Fitzherbert (10), Crossman (5), Johnston (5), Rutherford (5). The instructors were Messrs. G. W. Beatty, W. Roche-Kelly, and C. B. Prodger; the machines in use being Beatty-Wright dual-control and single-seater.

Three passenger flights were taken on the 18th, and exhibition flights were given by Messrs. G. W. Beatty and W. Roche-Kelly on the 15th, 17th and 18th.

Hall School.—Last week the following work was got through: Lieut. Blyth, 15 straights and half circuits on No. 1 Hall Tractor. Lieut. Raymond Barker, 14 straights on Nos. 3 and 1 biplanes. Laurence Minot, 30 straights on Nos. 3 and 1 biplanes. Cook, 35 straights on Nos. 3 and 1 biplanes. Hill, 42 straights on Nos. 3 and 1 biplanes. Cini, 20 straights on No. 3 biplane. Mitchell, 25 straights on No. 3 biplane. Mr. Stevens was making very good straight flights at 15 ft. on No. 1 biplane.

Pupil receiving instruction with Mr. J. L. Hall on No. 2 biplane: Mr. Hatchman.

Instructors of the week: Messrs. J. H. Moore and J. L. Hall.

Lieut. C. Osborne Fairbairn, who has taken his Royal Aero Club certificate at the London and Provincial School of Flying at Hendon.

London and Provincial Aviation Co.—Instructors during last week: Messrs. Warren and Smiles. Pupils with instructor in machine: Monday, Messrs. J. A. H. Crooke, W. D. Smiles, R. G. Gould, Gerrit Forbes rolling.

Tuesday, Messrs. J. A. H. Crooke, W. D. Smiles, R. G. Gould, Gerrit Forbes rolling.

Wednesday, J. A. H. Crooke, W. D. Smiles, R. G. Gould, Gerrit Forbes rolling.

Thursday, J. A. H. Crooke, W. D. Smiles, R. G. Gould, Gerrit Forbes straights.

Friday, Messrs. J. A. H. Crooke, W. D. Smiles, R. G. Gould, Gerrit Forbes straights; Mr. Lincoln circuits and eights.

Saturday, windy.

Sunday, Messrs. J. A. H. Crooke, W. D. Smiles, R. G. Gould, Gerrit Forbes straights.

In the afternoon Mr. Warren took up several passengers on 45 h.p. two-seater.

Ruffy-Baumann School.—On Monday last week, on 60 Caudron, with E. Baumann, Bell 12 mins., Roobaert (12). On 45 Caudron, Haydon (4), Kenworthy (4).

Thursday, on 45 Caudron, Roobaert (16), Jackson (8), Kenworthy (8), Blandy (8), Sykes (4), Cole (8), Bell (15), Haydon (30). In the afternoon, Haydon doing figures of eight, and took his ticket in good style.

Friday, on 45 Caudron, doing straights, Kenworthy (16), Bell (8), Roobaert, Jackson (16), Blandy (8), Cole (8).

Sunday, on 60 Caudron, with E. Baumann, Sykes (10) Jackson (12), Roobaert (10). On 45 Caudron, Jackson (20), Roobaert (36), Sykes (24). Instructors: E. Baumann and James Brothers.

Northern Aircraft Co., Ltd.

The Seaplane School, Windermere.—Flying on Monday, Tuesday, Thursday, Saturday and Sunday last week. Instructors, Messrs. W. Rowland Ding, C. L. Pashley, and J. Lankester Parker. With instructor: Flight-Lieut. Atherton (21 mins.), C. A. Barber (14), R. Buck (32), D. S. C. Macaskie (18), F. H. M. Macintyre (5), H. P. Reid (18), J. F. Ridgway (43), S. J. Sibley (11), H. Slingsby (14). Extra Practice: J. Lankester Parker (34 mins.). Figures of eight or circuits alone: S. J. Sibley on N.A.C. pusher biplane and R. Buck on Avro. Machines in use: N.A.C. pusher biplane and dual control Avro.

C. L. Pashley testing Avro on Saturday.

S. J. Sibley is now ready for his ticket, and only awaits favourable opportunity.

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FLYING AT HENDON.

On Thursday afternoon of last week, when it was an ideal day, quite a varied amount of flying was witnessed up at the aerodrome. The schools, one and all, were "hard at it," and the majority of the Hendon pilots were out, whilst several Government machines made test flights. At one time no less than a dozen machines were up and about, either "hopping" with pupils or on high with the finished article. On Saturday there was a puffy wind. This, however, as usual, did not worry the Hendon pilots, and much air work was witnessed by a fairly large attendance. The event of the afternoon was the visit of Mr. Winston Churchill, who made a thorough inspection of the Government machines—which were all lined up in a row for this purpose—and the hangars. The First Lord not only expressed himself well satisfied with the condition of the machines, &c., but appeared to mean what he said, and he was interested in the flying that took place during his visit. The first flight of the afternoon was made by W. Birchenough, who went up on a new 80h.p.

The First Lord of the Admiralty is interested in one of the B.E's.

Aircraft Henry Farman biplane. F. W. Merriman then took a turn on a 70 h.p. Maurice Farman (just rebuilt at the Aircraft works), and M. Osipenko ascended on a 50 h.p. G.-W. school 'bus. A biplane was then sighted several thousand feet over the aerodrome, and when it descended with some 20 beautiful spirals many rightly guessed the aerial visitor to be F. W. Goodden on a 70 h.p. B.E. On landing he was welcomed by many friends, and he reported a pleasant, but cold, journey from Farnborough, which had occupied some 40 mins. owing to a strong head wind. Geo. W. Beatty then ascended on a 60 h.p. Beatty-Wright biplane, and executed some stunts well worth seeing. He flew backwards and forwards alongside the enclosures, switchbacking in a remarkable manner, making exceedingly sharp turns on the close of each

A three-quarter front view of the de Havilland machine in the air.

journey up and down. As soon as Beatty had finished his "turn," his understudy, Roche-Kelly, came out on the 50 h.p. (Gnome) Beatty biplane, and put up one of his remarkable exhibitions of banking. Some of these banks were very nearly vertical, and the manner in which

HENDON 1915 SEASON OPENS.—A few of the men of the R.F.C. South African contingent having tea whilst watching the flying.

he brought the machine back to the normal was most extraordinary. Marcus D. Manton did some fancy work on the 70 h.p. G.-W. biplane, whilst J. S. B. Winter put up some stunts on a 50 h.p. G.-W. school 'bus. J. L. Hall next ascended on his 45 h.p. Caudron, and after climbing to an altitude of about 1,500 ft., descended with a pretty spiral *vol plané*. Osipenko and Manton, both on 50 h.p. G.-W. 'buses, next tried their hand at bomb-dropping, and some of the visitors expressed disappointment at the "bombs" not going off with a "bang." The two Beatty bankers then gave another demonstration, after which Manton, Osipenko, and Winter took up several passengers on the G.-W. biplanes, whilst a start was made with school work.

Sunday afternoon was almost a dead calm, and very fine; in consequence there was plenty of flying to satisfy a very good attendance, naval and military officers being very much in evidence. The first up was J. L. Hall on his 45 h.p. Caudron, and shortly after W. T. Warren made a flight on the new 45 h.p. two-seater L. and P. biplane, which, by the way, is a credit to the L. and P. works, not only as regards construction but also in its behaviour in the air. Its speed is well in the neighbourhood of 50 m.p.h., whilst it is a good climber. The next up was Roche-Kelly on the 50 h.p. Beatty biplane, "banking as usual"; then followed Wright—a new G.-W. instructor—on a 50 h.p. G.-W. 'bus. After this, Osipenko and Manton gave another bomb-dropping demonstration, Manton subsequently changing over to the 100 h.p. (Green) G.-W. 5-seater biplane, and gave many visitors a trip in the central blue. The rest of the afternoon and evening was spent in passenger flights—34 passengers in all were taken up—and school work.

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Salmet Mentioned in Army Orders.

UNDER date of April 7th, H. Salmet, who is now Maréchal des Logis, Squadrille C. 9, in the French Aviation Service, was specially mentioned in the French Army Orders. His exploit is officially set forth as follows:—

"This impulsive and audacious pilot did not hesitate on a scouting expedition to approach a German warplane within 37 yards, so as to permit the observer to shoot at it.—General Hambert, Commander of the D. A. L."

Aerial Attacks on Steamers.

THE captain of the Cork S.S. Co.'s "Serula," on arriving at Rotterdam on the 12th, reported having been attacked by an aeroplane and a seaplane near the North Hinder lightship, about twenty bombs being discharged. The captain fired at the machines with his rifle and sent up rockets, and eventually they made off. The "Tinker," of the same line, was also attacked in the same vicinity two days later.

A report from Copenhagen on the 20th stated that the steamship "Uranus," while on a voyage from England to Halmstad (Sweden), when just off Lowestoft encountered a Zeppelin, which threw two bombs, both of which fell wide.

FLIGHT

EDDIES.

THE dangers of flying, which have always been greatly exaggerated by the uninitiated, are rapidly decreasing, and there is at least one instance on record of a man who is inclined to envy the aviator his elevated position of security. The man in question is an artist found by Professor Pares, the authorised correspondent at Russian Headquarters, who describes his meeting with this artist: "On one of these scouting expeditions I found a man of the most quaint simplicity, an artist, who sat down between the lines and sketched the enemy's positions. He described with an impersonal unconcern how the bullets passed him. 'But what do you do when you have finished?' I asked. 'Oh, I go on to another position.' 'But, surely, it is very dangerous work?' 'Yes, I suppose there are about ninety-nine chances in a hundred of my getting killed, but I haven't any children. I should rather like, however, to do the work from an aeroplane; I think that would be safer.'"

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With the exception of one or two enthusiasts who are reported to have been for the last couple of years, using flying boats for the daily trip from their country homes to their City offices, New York business men have not so far taken to this means of locomotion. It looks, however, as if the coming summer may see a great increase in the number of New Yorkers who will avail themselves of this rapid and comparatively safe form of travel. Already several members of the Aero Club have ordered and many others are contemplating the purchase of flying boats for running between Long Island Sound and New York City. For their convenience, the Aero Club of America has officially adopted the suggestion of the Automobile Club of America to make the East River at 72nd Street, New York, its principal landing station, where the Automobile Club has recently opened a garage and club rooms. Here supplies of motor parts, oil and petrol can be obtained at any hour of the day or night. People arriving by air in the morning can take their motors from the garage to their business premises, and on returning in the evening the motor can be left at the garage, and the rest of the return journey made by air. It will, therefore, be possible for New York business men to live at, say, Newport, and come up to the City every day, as the distance is only about 150 miles, or, in other words, little over a two hours' flight on a fair day. As the starting and alighting place is fairly sheltered, and the trip can be made over the water throughout, there should be few days during the summer months when the weather would be likely to prevent the journey.

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A very unsettled existence is that of the German Aviatik works, which were, as related in "Eddies" at the time, shifted from Mulhouse to Freiburg owing to fear of damage by the Allies. Whether our pilots have found out the location of the works at Freiburg and have been making it too hot there, I am hardly in a position to disclose, but somebody has evidently been causing uneasiness, for according to the *Strassburger Post* it is contemplated removing the Aviatik works to a central German town. Ah, well, some of our machines have an extensive radius of action.

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The flying ground at Johannisthal has always had a bad reputation for accidents, and the frequency with which these occur does not appear to have diminished since the outbreak of war. Hardly a week passes without some serious accident, a large proportion terminating fatally. In October, volunteer pilot Post and a pupil Silberhorn both met their deaths. A third pilot, Hoffmann, was also killed in a fall from a height of 1,000 metres, while his passenger Lieut. Santen only received slight injuries. On November 3rd, the naval pilots Trost and Klette were making a practice flight, and had to make a forced landing owing to engine trouble. The machine fell from a considerable height, and both occupants were killed. Again, two aviators whose names are not stated fell with their biplane in the early part of December, and received severe injuries. On January 26th two military biplanes collided in the air, one of which had only the pilot on board, while the other was carrying a passenger. All three were killed. The names of the pilots were H. Konrad and G. E. Müller, and the passenger was W. Böhme.

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Naturally at Christie's last week, many of the *habitués* were amongst the crowds which thronged the famous King Street Auction Rooms. But by far the greater proportion were somewhat foreign to their surroundings, which was hardly to be wondered at. It is not every day that such an unique series of lots are disposed of, as the "book of the words" set forth for competition, in deserving support of the British Red Cross Society and the Order of St. John of Jerusalem in England—to be exact as to title. Unique most assuredly were many of the gifts which had been gathered together from sympathisers with the troubles of their country, and one pathetic donation was closely associated with the Flying cause—to wit, a couple of potato-rings, which belonged to Samuel Pepys Cockerell, of the Royal Flying Corps. These had been a contribution from his parents, who presented the rings to the cause in memory of their son, who met his death in Egypt in the service of his country.

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And their appearance was a goodly help to the cause, for the first went to a pocket bid of the auctioneers of 500 guineas, and the same sum for the second kept the two together with one buyer—Lord Newlands. What their real value might be did not emerge, and presently it transpired that the treasures had been given back to the family of the dead man, so that in time, maybe, they will be again forthcoming for some other good cause.

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But it was a pretty way of Lord Newlands of subscribing 1,000 guineas to the Fund. It would, indeed, be a bit of luck if there were a few Lord Newlands, combined with potato-rings, in connection with the Flying Services Fund.

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Maybe a potato-ring is an unknown quantity with many of my readers. By way of satisfying curiosity in advance as to the nature of these treasured relics, the potato-ring is a pierced shallow bucket of silver-work, formerly used in Ireland as a stand for a dish, so called from the erroneous belief that its purpose was to hold in position a heap of potatoes on the table.

"ÆOLUS."

NATURE AND THE ART OF FLYING.

THE following appreciation in a *Times* leader this week of the men who ride the wind has a charm of its own, and may, we think, be appreciated by many of our readers :—

Flight.

The plovers, gracefully flopping through the air, are beginning to gladden our eyes. Perhaps they have no taste for lyddite, and have abjured the devastated acres in France and Flanders for sanctuary here, adding to the unconscious number of debtors to naval supremacy. Be that as it may, it is good to have them with us again, astounding the watcher with their careless miracles of flight. They will "climb"—the slang of the airman is inevitable—three hundred feet or so, utter two or three cries on a note higher and more tense than that of their accustomed call, and then execute, now a perfect *vol plané* that swings into the horizontal at lightning speed, so close to the grass blades that they bend with the down-rush of air, now a "cartwheel" like that of a shot partridge, a twirling chaos of movement that none the less turns, as you catch your breath, into a steady, balanced sweep not a foot from the ground. So did Chanteloup, at Hendon, make his biplane careen, circle, fall and recover; but the bird is still infinitely his master in achievement, if not in daring. Small wonder that a flying man, suddenly catching sight of a plover at his exercises, snatched at his friend's arm and cried, "Look at that bird! He'll kill himself."

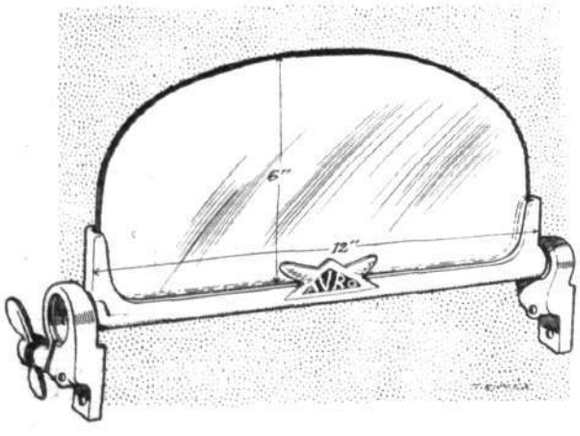
When trick flying became a matter first of wonder and then of notoriety, people asked themselves and each other, with their customary good sense, what might be the use of it all. It was clear that something had happened to aviation. Flying men—the experts—came to be divided into those who had dared the thrill and the apparent peril of "looping the loop" for the first time, and those who had not. After the first time, it appeared, few or none failed to persist in and to recommend the practice; it was, one gathered, the rubicon in the advanced art of flight. So, when several small schoolboys had learned to swim, do those comport themselves who have further learned to take a header—not with superior airs, but with an unassailable under-consciousness that they have dared something better worth daring than the mere trust in a sustaining element. It is truly a test of the human soul to be able to dare, deliberately, a moment upside down, be the peril involved that of a broken neck or merely of a somewhat reddened abdominal surface. That is, perhaps, the "use" of upside-down flying: to show coolness in the air, in the worst of weather, and also under fire, a man needs to be sure that whatever the position of the next moment may be it will not be wholly unfamiliar.

The plover, it seems, performs his amazing evolutions to impress his mate; at all events there is invariably a demure person to be seen, her black-and-white wings folded, trading the outskirts of his flying ground. Why did the flying man undertake to give a similar but a far more risky performance. We may draw the analogy that here also was a mistress to be pleased. Her name was Adventure, and her nature was of that feminine soul of the public which rightly loves danger bravely incurred. She was a mistress to be looked upon, in peace time, with a cautious and critical eye; but now her claim and her criterion are paramount. Great adventure is recognised to be the highest prize of war; more, it is felt to be the highest justification of the warrior. Our flying men, doomed to thought and imagination, dare that which no bird has faced; and our plovers, dear as they are to us, and wonderful, as is their technical mastery, are, after all, outdone.

TRIPLEX SAFETY GLASS SPECIALITIES.

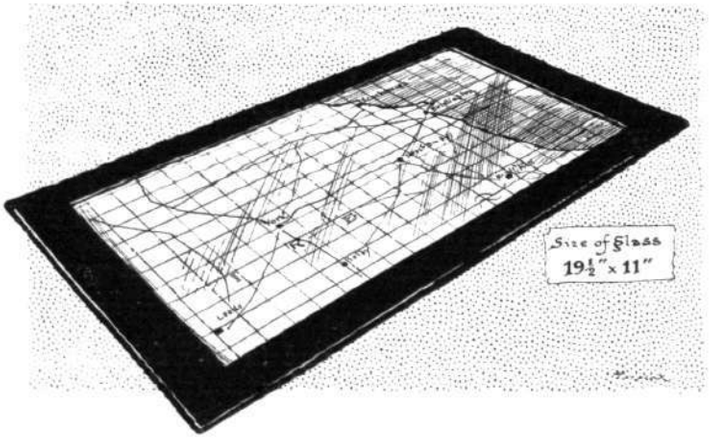
SOME of the uses to which Triplex glass has been put in connection with aviation have already been dealt with in these columns, and in our illustrations on this page are seen two further applications.

The light windscreen is a fitting for which the Triplex Safety Glsss is peculiarly adapted by reason of the impossibility of its splintering in the case of a bad landing. This is, of course, due to the way in which Triplex glass is built up of two sheets of glass with a sheet of transparent xylonite cemented between them, the combination being amalgamated into virtually one solid substance by enormous hydraulic pressure. The result is, that should the glass be damaged it cannot fly into fragments, the non-brittle property of the xylonite binding and retaining together the whole mass as described.



In the windscreen illustrated, the "glass" is mounted in a strong but extremely light aluminium frame of Beatonson make, for its lower edge and a couple of inches or so on each side. This frame is in turn mounted in two brackets, also of aluminium, by means of bronze trunnions; one of these brackets is split and can be clamped tightly on to its trunnion by a steel bolt and a butterfly nut, thus allowing the screen to be adjusted to any desired angle and instantly. We understand that a large number of windscreens of this type are being supplied to Messrs. A. V. Roe and Co.

The other sketch shows a sheet of Triplex glass which is specially made for use with maps on an aeroplane.



In order to facilitate the reading of distances 1-inch squares are printed in red on the xylonite between the two sheets of glass. The sheets are clipped into a map-holder consisting of a leather frame with aluminium clips, and in this form are being used, we understand, by several firms including Messrs. Armstrong, Whitworth and Co. and Messrs. Vickers. Full details regarding these and other applications of Triplex glass can be obtained from the Triplex Safety Glass Co., 1, Albemarle Street, Piccadilly, W.

FLIGHT

THE SCREW PROPELLER.

By F. W. LANCHESTER, M.Inst.C.E.

(*Continued from page 267*).

PART I.—*The Stationary Screw Propeller.—The Problem of the "Helicopter."*

5. In the theoretical discussion of the screw propeller the problem of the stationary propeller, that is to say, the propeller working under the conditions of the screw ventilating fan, has received comparatively limited attention; there is, for instance, no authority to whom the would-be designer of a direct lift machine of the "Helicopter" type can turn to tell him whether his projects have any chance of success, or to guide him as to the lines on which to experiment, or to develop his ideas.

At first sight it might be supposed that the problem of the screw ventilating fan and that of the stationary propeller (as involved in the helicopter problem) are one and the same; in neither case can we speak of efficiency in the sense of screw propeller efficiency, for the mounting is fixed, and there is no useful work done in propulsion; thus reckoned from screw-propeller standards the efficiency is zero. If the object were the same in both the screw ventilating fan and the helicopter, the problems themselves could, with certain reservations, be regarded as identical, but according to the best authorities, there is an actual difference; in the helicopter the problem is to obtain the maximum of lift with the minimum power expenditure; in works on the screw fan, stress is usually laid on the *volumetric efficiency*, in other words, the quantity of air passed. Without questioning the commercial expepediency of this latter view, it is worthy of remark that it seems to be based on the assumption that there is a certain sized hole in a wall, and that somehow or other the necessary volume of air has to be got through that hole, the best fan is the one whose *delivery/h.p.* is the greatest; it does occur to one that it may sometimes be the better expedient to enlarge the hole, and thereby reduce the h.p. required; however, the problem has presumably been worked out by hard experience, and eventually there must be some maximum size of hole permissible, and once this is admitted, the best fan is clearly the one which passes the most wind for a given horse-power. Now in the case of the helicopter, since the direct problem is to lift a certain weight, the indirect problem is to communicate a definite quantity of momentum (downward) to the air per unit time, which is a different matter to the displacing a given volume, and it is this which makes the two problems essentially different.

There is one particular case of the screw ventilator which perhaps may be regarded as exempt from the ordinary limitations—the ceiling *punkah* as frequently to be seen in Continental restaurants; here the diameter limit no longer exists, and the object is otherwise to stir up the air rather than displace it, and it may be generally inferred that the effectiveness of the appliance will be proportional to the downward force continually exerted by it on the air: thus the conditions appear to be identical with those in the case of the helicopter.

6. In a recent paper contributed by the author to the spring meetings of the Institution of Naval Architects, the fundamental dynamic basis of the helicopter in the sustentation of its load is discussed as a matter apart from the means or mechanism to be employed; that is to say, the problem dealt with is that of the sustaining of a load by direct reaction on the fluid (air in the actual problem), distributed over a certain area or disc, the treatment adopted being on the lines originally laid down by Dr. R. E. Froude, already referred to in the introductory section of the present paper. On the basis in question it is shown that the weight in pounds which may be sustained per h.p., under the best conceivable conditions, is given by the following formula,*

$$\frac{W}{\text{h.p.}} = 550\sqrt{\frac{2A\rho}{32{\cdot}2W}} \qquad (1)$$

where A is the area of the propeller disc, W is the weight sustained, and ρ the density of the fluid, in the case of air approximately 1/13 or 0·078.

The author, in the paper in question, pointed out that the above may be expressed in very simple terms: *for one ton gross weight the pounds sustained per h.p. will be numerically equal to the diameter of the downward current, that is to say, approximately 0·7 of the diameter of the propeller disc in feet.* Thus a gross load of one ton sustained by a propeller 40 ft. in diameter will require one h.p. for every $40\times0{\cdot}7=28$ pounds weight. This is, of course, the absolute theoretical minimum for the conditions given, apart from all losses incidental to the employment of screw or other mechanism by which the downward current is maintained. In the case of the screw these include skin-frictional or direct blade-resistance losses; also those represented by the rotational component of the "wake."

Admitting the deficiencies of the Froude hypothesis on which the above computation is based, the power required, apart from the final means of propulsion, must actually be in excess of that stated. The author has introduced a modification into the Froude treatment involving a factor to represent the losses of energy proper to the modified *régime* (as distinguished from *instrumental* losses), this being denoted by the symbol Q, a quantity less than 2 and greater than unity; the expression becomes

$$\frac{W}{\text{h.p.}} = 550\sqrt{\frac{2A\rho}{32{\cdot}2QW}} \qquad (2)$$

Thus, the weight sustained per h.p is less than under the precedent conditions in the relation of $\sqrt{Q}:1$. There is at present very little information on which to base estimates of the value of Q. For the main purposes of the present paper, Dr. Froude's law will be taken as basis, *i.e.*, Q will be taken as equal to unity; thus our results must be regarded as on the *optimistic* side of the truth. The efficiencies we shall deduce will be rather better than in practice we can hope to obtain; it is not, however, in the present state of theory *always* certain that the methods dealing with the means of propulsion—the instrument of propulsion—do not automatically include also the losses of *régime*.

7. Let—

V_1 = velocity of the blade element in its circular path. v_2 and v_3 = respectively the axial and circumferential components of the impressed wake velocity. u = axial wake velocity component in the hypothetical "plane of propeller." η = maximum angle of a hypothetical impelling surface; the maximum angle of the *primary camber*, compare paper on "The Aerofoil." A = area of the foil (or its containing rectangle), such that An is the square of the span and $\frac{\pi}{4}An$ is the peripteral area. m_t = mass of air dealt with per sec. E_t = energy expended in downward component of wake on the Froude basis, $u = v_2/2$ (otherwise $Q = 1$). ξC = the direct *surface resistance*, or *skin-frictional*, coefficient in absolute units. n = aspect ratio. Q = constant as defined.† ρ = density of fluid.

Referring to Fig. 4, we may write at once—

$$V_1 = \frac{v_2}{\sin\eta} \qquad (3)$$

and

$$v_3 = v_2\tan^2\frac{\eta}{2} \qquad (4)$$

Now,

$$m_t = \frac{\pi}{4}An\rho\ V_1 = \frac{\pi}{4}\frac{An\rho v_2}{\sin\eta}$$

$$E_t = \frac{m_t v_2^2}{2} = \frac{\pi}{8}\frac{An\rho v_2^3}{\sin\eta} \qquad (5)$$

Energy/t lost in direct blade resistance

$$= V_1 \times \xi C A\rho V_1^2 = \frac{\xi C A\rho v_2^3}{\sin^3\eta} \qquad (6)$$

or in terms of E_t

$$= \frac{8\xi C}{\pi n\sin^2\eta} \qquad (7)$$

and aerodynamic loss (in rotational wake) is,

$$E_t\tan^2\frac{\eta}{2} \qquad (8$$

or in terms of E_t

$$= \tan^2\frac{\eta}{2} \qquad (9)$$

∴ total energy/t loss in terms of E_t is,

$$\frac{8\xi C}{\pi n\sin^2\eta} + \tan^2\frac{\eta}{2} \qquad (10)$$

∴ Efficiency is,

$$\frac{1}{1+\dfrac{8\xi C}{\pi n\sin^2\eta}+\tan^2\dfrac{\eta}{2}} \qquad (11)$$

Graphs of efficiency calculated from this expression are given in Fig. 5; for values of aspect ratio $n = 2{\cdot}5$ and $n = 5{\cdot}0$. ξC is taken as 0·01, a value which under ordinary circumstances is not far from the truth.

The basis of the foregoing is the assumption that $Q = 1$.

* When the whole power expended is represented by the kinetic energy of the downwardly impelled "wake" stream. Under these conditions the velocity (downward) in the plane of the propeller is half the ultimate velocity, there being a contraction in the stream just as that which takes place in efflux phenomena during the period of acceleration.

† $Q = \dfrac{\text{Energy expended}}{\text{Energy in wake stream}}$. Comp. "A Contribution to the Theory of Propulsion." *Proc. Inst. Naval Architects*, 1915.

Further graphs are given in Fig. 6, on the basis of $Q = 2$; Figs. 5 and 6 thus represent the probable extreme limits.

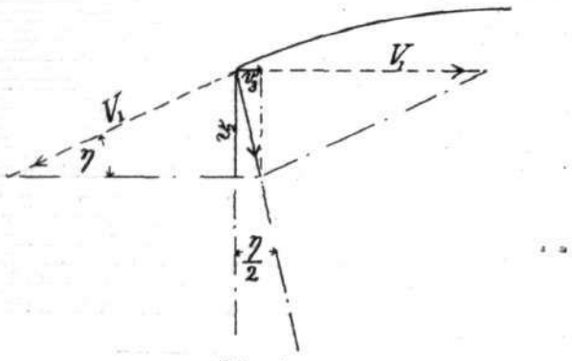


Fig. 4.

8. We next require to investigate the question of the number of blades, that is to say, we have to determine the minimum number necessary to deal with the whole of the column of fluid—air—contemplated in theory as passing through the propeller disc area. The foregoing investigation refers specifically to a single blade, but it is clearly applicable to any number of blades, provided that there is no interference, in other words, on condition that their peripteral areas do not overlap. As a matter of fact, the question of interference is one of degree rather than one of actual definition; thus, it is one in connection with which we need to establish some sort of a convention. In the rather similar case of the spacing of the two members of a biplane aerofoil the same question crops up; here the matter has been settled experimentally; it is shown that when separated by a distance somewhat in excess of the chord dimension, the "biplane" disposition gives between 80 per cent. and 90 per cent. of the lifting power of the two members separately, the *resistance/lift* ratio being lowered in almost exactly the same proportion. The interference still exists, therefore, and results in a loss of about 15 per cent. of the effective area of the supporting surface; but in spite of this it is generally agreed to accept a spacing of 1 to 1·5 times the chord as being the practical limit of serious interference.

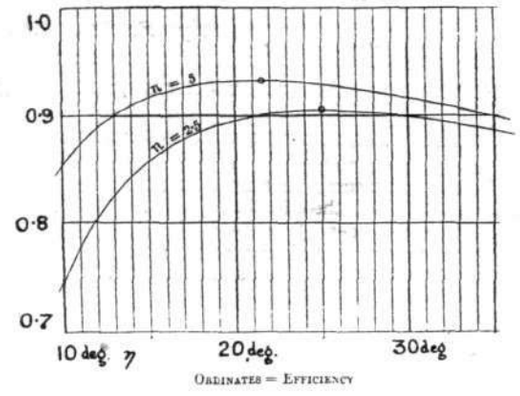


Fig. 5.

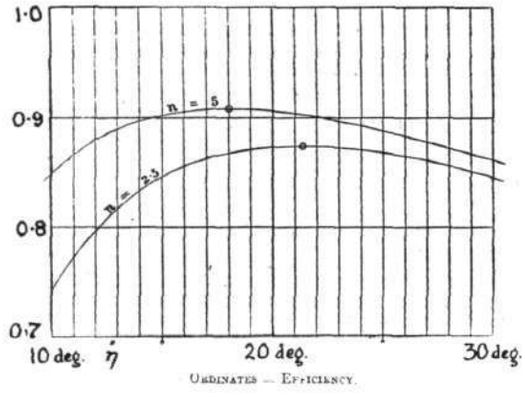
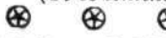


Fig. 6.

(*To be continued.*)



LAST WEEK'S AIRCRAFT RAIDS.

ELSEWHERE in this issue attention has been given to certain aspects of the German air raids on certain sections of the English coast at the latter end of last week, and for the purpose of record the actual facts are noted below.

The first visit was on the evening of the 15th inst., when a large airship, presumably a Zeppelin, appeared off Blyth about 8 p.m. After dropping half-a-dozen bombs on the outskirts of Blyth it went inland, and sweeping round to the south, dropped bombs at Choppington, Bedlington, Hartford, Cramlington, Seaton Burn and Benton. Going on to Wallsend five bombs were dropped, and then after crossing the Tyne the raider made for the coast and passed out to sea, after being over the land for about 35 minutes, during which some 30 bombs, mostly of an incendiary type, were discharged. The damage done was insignificant, consisting of minor fires at Choppington, Seaton Burn and Wallsend. The only person reported injured was a miner, who happened to be walking near Bedlington, and had his wrist struck by a fragment from a bomb. According to some reports two airships were seen, while others state the bombs were dropped from a cage suspended some distance below the airship. At Blyth, a recruiting campaign happened to be in progress, and the Zeppelin provided the speaker with a timely object-lesson. According to competent spectators the airship at one time was not more than 1,000 ft. high. Several skippers of trawlers reported having seen a Zeppelin at sea, and from these reports it appears that the raider was the naval airship L9.

In the second airship raid, which took place in the very early hours of the 16th inst., apparently two airships were engaged, one operating along the Suffolk and Norfolk coast, while another made a circuit from Harwich to Maldon. It was just after midnight that the first raider was reported at Southwold, where five or six bombs were dropped. The aircraft then made a circuit to Halesworth, dropping three bombs near the military hospital at Henham, and after returning to Southwold, went along the coast to Lowestoft, bombs being dropped at Reydon, Easton, and Covehithe. Three shrapnel and seven incendiary bombs were discharged on Lowestoft at about a quarter-past one. Several fires were started, but speedily got under, and three horses were killed. An airship was reported as having been seen at Wells, Cley, Cromer, and other points on the Norfolk coast about 2 a.m. going in a south-easterly direction.

The second airship appears to have followed the River Blackwater to Maldon, between where and Heybridge it dropped a couple of dozen bombs about 12.20 a.m. It then appears to have made for the sea again, two bombs being dropped at Tillingham, while the airship was seen at Clacton, Harwich, and Felixstowe.

The aeroplane raid took place later in the day. About noon a German biplane was sighted coming from the sea, and it passed to the north of Deal. Flying by Whitstable it steered over Faversham, dropping four bombs, and then to Sheerness, afterwards turning off to Sittingbourne, where a bomb was dropped. As the anti-aircraft guns were brought into action, and British machines rose to attack, the machine made for the sea, *via* Faversham. It was reported to have passed out to sea again to the south of Deal at 1 p.m.

FLIGHT

AIRCRAFT AND THE WAR.

A *Morning Post* correspondent in the North of France, writing on April 14th, said :—

"Although the Germans are not displaying much activity against us, probably because they have drained their lines in the north for the moment to send every available man to Champagne and the Woevre, which are the danger spots for them now, they have redoubled their work in the air. Never since the war began has there been such an intensity of bomb-throwing exploits as within recent days. Further, they would seem to be experimenting with new and heavier bombs for aeroplanes. On Monday a Taube attacked a railhead of ours, where a hospital train was loading up. There were consequently a considerable number of troops about, as well as helpers. It threw only one bomb, so far as I can gather, but that one created a very severe explosion. Such a bomb from an aeroplane has not been seen heretofore.

"About the same time, too, the Suffolks were attacked by an aeroplane as they were marching on a road. It threw five bombs. The Zeppelin that flew over Bailleul during the night of Monday-Tuesday proves that, contrary to rumour, these aerial freaks are still being kept towards this front. Its visit is a little curious, and illustrates the activity of the spy. Certain high officers had been expected to stop in Bailleul that night, but at the last minute did not do so ; but it has been ascertained that the Germans had information of the intended visit. Yet another bomb-throwing aeroplane attempted to attack Furnes, but was brought down by a Belgian armoured motor car and the aviator killed."

The *Tyd* on April 14th printed the following message from its Sluis correspondent :—

"A Zeppelin fired at and damaged near Ypres on Monday night, managed to return to Thielt, where it landed in a battered condition.

"Last Sunday morning four Allied aeroplanes appeared above Bruges and heavily bombarded the place from all sides. On Monday an airman dropped bombs on the old docks at Bruges, destroying two houses."

The following details regarding the wrecked Zeppelin was given in the *Daily Mail* on the 20th inst., by a Belgian who recently arrived in London from Ghent :—

"The newspapers have already related how the Zeppelin airship which made a raid on Bailleul and killed five women came to grief on its return journey. The Zeppelin on its outward journey passed over Ghent at about nine o'clock on the night of April 12th. Next morning at dawn two aeroplanes could be seen hovering above a point near Ghent as though searching for something, and when the milk-carts came into the town they told the inhabitants that an airship was wrecked at Aeltre, between Ghent and Bruges. I went out to the spot, but no one was allowed nearer to it than 300 yards. With glasses, however, one could see that there was a huge rent in the rear part of the envelope and that all the framework was broken. The pines had also torn the cover in many places. I could not make out the number of the airship. Two hundred German soldiers were on duty round the wreck, and all seemed in a very bad temper. On the other hand, the Belgian onlookers were in the best of moods, and smiled and laughed openly as they pointed to the disabled raider. I was told that there were seventeen men in the Zeppelin, of whom eleven were killed. But the sentries said that the death-roll was nine."

A *Times* correspondent, writing from Paris on April 15th, said :—

"The airmen of both armies continue to show great activity in Alsace. A Taube appeared over Gérardmer, in the Vosges, but was driven off by gunfire before it could drop bombs. Another got as far as Lunéville, but was pursued by a French aeroplane and brought down with machine-gun fire.

"According to a German report, a French airman flew over the Black Forest yesterday morning, dropping four bombs on Stockach."

The *Morning Post* correspondent at Petrograd, writing on April 16th, said :—

"A lady aviator has received the decoration of the St. George's Cross for some useful aeroplane scouting at the fortress of Ossowiec."

The following was sent by the special correspondent of the *Daily Telegraph* at Bale on the 16th inst. :—

"A combined attack by five French and one British aeroplane was made to-day on a number of German towns on the right bank of the Rhine, and some forty bombs were thrown. It was eight o'clock this morning when the first biplane appeared over Tullingen heights, and from the colours it was distinctly recognised as a British machine. It was followed by five others, which were French, and which went farther up the Rhine, dropping bombs as they went along. The British machine came down very low over Haltingen railway station, dropping five bombs with remarkable precision on empty carriages. Three of these carriages, which contained no passengers, were destroyed. The bombs smashed the gas conduits, and a gas tank took fire, and soon the fire spread to the station buildings. The flames could be seen from Swiss territory. The biplane continued its flight, dropping three bombs farther down at the junction of the line for Bale and Freiburg. The enemy opened fire on the daring Britisher, and one shell struck him and disabled his machine between Hegenheim and Burgfelden, where it came down. The two occupants were wounded and taken to hospital at St. Ludwig, but they had had the satisfaction of having carried out one of the most daring and successful raids on this side of the Rhine since the beginning of the war."

The following was sent on the 16th inst. by the *Morning Post* correspondent at Berne :—

"This morning, between half-past seven and eight o'clock, a French airman dropped a bomb on the new station at Haltingen, in the Grand Duchy of Baden, near Basel, setting the station on fire, destroying a portion of the railway line, and doing other damage. The airman was shot at from the Hüningen forts, but escaped safely."

A *Daily Telegraph* correspondent at Rotterdam, writing on the 16th inst., said :—

"Three Zeppelins, evidently returning from a raid on the English coast, were seen from the Dutch island of Vlieland at five o'clock this morning. They were coming from the west, and were flying in a north-easterly direction. The first two passed by the island ; the third flew over it. Thereupon the Dutch sentries fired warning shots, and the Zeppelin altered its course accordingly."

Writing on April 17th, the North of France correspondent of the *Morning Post* said :—

"Yesterday the German aerial activity, to which I have called attention in recent despatches, reached its highest pitch of interest. There was a raid upon Amiens, which exceeds in its murderous effects anything of the kind that we have so far experienced, and the havoc caused by the bombs tends to confirm the opinion which is now held, and to which I also recently referred, that a much more powerful projectile is now being used, although whether in respect of its size or the nature of the explosive it contains is not so far clear.

"It was about half-past seven when the first of the two Taube machines made its appearance over Amiens, and its bomb fell among busy streets in the working class quarter alive with operatives on their way to work. It dropped five in all, killing six and wounding seven people, several of the latter being very seriously hurt. The first fell on a bridge over the Somme, tearing a hole in the structure and damaging over twenty houses. A territorial sentry had his leg fractured and an artery severed, and a commercial traveller was wounded in the neck. The second fell outside a tobacco shop. It smashed in every shop front within a radius of a hundred yards. The tobacconist lost both legs and was otherwise shockingly injured, an elderly woman was decapitated, and in all this bomb killed five and injured four. Doors and windows were wrenched from their hinges, and the damage to property was extensive. The last two bombs fell harmlessly in the suburbs.

"Towards five o'clock in the afternoon a second aeroplane bombarded the defenceless open city, which has not even the merit of being an important military centre. This one contented itself with two bombs. The first fell on a cheap tenement house, which it wrecked, decapitating one woman and seriously injuring another about the head. The five children of the former had a miraculous escape. They were in the house when their mother was killed, but fled panic-stricken without a scratch. The second bomb fell in the garden of the Curator of the Picardy Museum, but did no harm. In all, fifteen people were killed or wounded by seven bombs.

"Meanwhile Calais was also coming in for attention, an Aviatik machine slipping through the guards and commencing its dastardly operations also at the hour when workpeople were hastening to work. Two bombs fell in the town, causing, however, only material damage, before the artillery opened fire, upon which it fled rapidly, throwing other five bombs as it went. A horse was killed and some sheds damaged, but no person was hurt. Still, the explosions made holes about 6 ft. in diameter.

"Several others have been pursued by our aviators in the northern district, one which tried to slip in on Boulogne from the south early this morning having an exciting chase from two watchful

biplanes, which were, however, outpaced by the raider. There is not the slightest sign of fear among the populations nor any panic even when bombs are falling. It is evident that the war spirit has thoroughly entered into the nation, and that it is sternly determined to bear the hardships, whatever they may be, as they arise."

In the "wireless" news sent out from Berlin on Saturday, there were the following items :—

"One of our airmen who dropped bombs on Calais the day before yesterday flew over Greenwich, near London, and dropped some bombs.

"During the night from the 15th to the 16th inst. bombs were dropped with success by a German naval airship on several defended towns on the south-east coast of England. The airship was met by heavy firing both before and during the attack. It returned safely.

"It is reported that early on the morning of the 16th inst. two German airships appeared over Maldon, Essex, and dropped four bombs without doing any material damage. They also threw bombs on Weybridge. Three kilometres further on some houses were set on fire. The airships continued their flight over the course of the River Blackwater. In the early morning an airship coming from the sea flew over Lowestoft and dropped three or four bombs. Three explosions were heard, and a woodyard was set alight. One woman was slightly injured. Six bombs were dropped on Southwold. The airship then made for the sea.

"A German aircraft dropped bombs on Sittingbourne and Faversham, Kent, which, however, did no damage. In its flight it passed over Sheerness, where it was fired on.

"A French airship last night visited Strassburg, dropping several bombs. The material damage done, mainly consisting of the breaking of window glass, was unimportant. Unfortunately some civilians were wounded."

In the *Matin* of Saturday last it was announced that for the third time bombs have been thrown by German aircraft upon Swiss territory, near Beurnevesin. The Swiss authorities repaired to the spot, and their inquiries elicited proof that there had been numerous bomb explosions. The Swiss Government will issue a protest against the action of the German aviators.

The *Daily Telegraph* correspondent at Copenhagen, writing on Saturday, said :—

"According to a message from Berlin an enemy airship dropped a dozen bombs on Strasburg, thereafter disappearing in a northerly direction. Two persons were injured, and the authorities forbid particulars of the material damage, which I learn is very important."

According to other advices 12 bombs were dropped at 1.30 a.m.

The following account of the raid on Strasburg was given by the local correspondent of the *Berliner Tageblatt* :—

"The citizens of Strasburg were asleep, but the military were vigilant on that starlit spring night, and the searchlights were busy. Shortly after half-past one explosions startled the inhabitants. The gravity of the situation was quickly recognised. The few people who were in the streets heard the buzzing of the airship's propeller, and as precautionary measures sought the protection of the nearest houses.

"Then at short intervals followed the sharp reports of the anti-aircraft guns, the fireballs showing up the airship, which was of the size of a Parseval. There followed an exciting quarter of an hour.

"Sewer workers clambered fearfully from their holes, being afraid to remain underground. The bombs thrown by the enemy were mostly of heavy calibre, but, strange to say, they completely missed their objective. It is generally believed that the first of the heavy bombs fell on the brightly lit railway station as well as in the station square. On the railway station an incendiary bomb shaped like a stove-pipe of cast steel is said to have fallen. A locomotive man was injured.

"The effect of the second bomb was very slight. It fell on the station square immediately in front of the post office, and bored a hole large enough for a fifty-litre barrel to enter. An electric mail van standing in the vicinity suffered considerable damage. Within fifty to a hundred yards around few window panes remained unbroken.

"The Kronen-burger-street, for a width of four yards, was badly torn up. The airship eventually went south and disappeared."

According to a telegram to the *Journal* from Rome, on Saturday, one of the two Zeppelins which the Austrian fleet had received from Germany, and which were based at Pola, fell into the sea while manœuvring over the Adriatic, and was completely destroyed, the crew being drowned.

The *Temps* on Sunday gave the following details of the bombardment of Haltingen railway station by a British aviator, as reported by its Geneva correspondent :—

"Taking advantage of the morning mist the biplane was able to approach the Rhine at 7.30, and eluding the notice of the observers stationed in the neighbourhood of the Sundgau, dropped four bombs on the southern part of the Haltingen railway station, without injuring any person, but destroying the track for goods trains for a distance of 100 metres. The aviator was fired upon at Tullingen by the artillery, which commands the station, and by quick-firers on the plain. The biplane went off in a northerly direction, following the Rhine valley, in the direction of Mülhouse. The Istein forts also fired upon it, but owing to the great height it was beyond their range. Towards noon a French squadron of aeroplanes was sighted in the region of Volkensberg. Another French aeroplane made a reconnaissance above Loerrach, in the Wiesenthal.

"The renewed Allied aeroplane raids are believed by the Germans to be due to the desire of the Allied aircraft to reach Lake Constance and the Zeppelin factory at Friedrichshaven, where work has been redoubled, which, according to the *Saint Galler Tagblatt*, now turns out a complete Zeppelin every two weeks, with an approximate displacement of 25,000 cubic metres, while the former ones had a displacement of only 17,000 cubic metres."

The correspondent of the *Daily Telegraph* at Petrograd, writing on Sunday, said :—

"In the Ostrolenka and Tzechanoff districts a good deal of activity has been shown by the German aviators, who, in parties of twelve to fifteen, make concentrated attacks on individual villages and towns, into which they throw at a time as many as 180 small bombs. They are, however, said to have caused practically no loss of life by these methods. The Russian aviators retaliate with a smaller number of larger bombs, with which, apparently, better results are attained."

In the "wireless" news sent out from Berlin on Monday there was the following :—

"Flight Lieutenant Garros was forced to land near Ingelmünster, in West Flanders (midway between Ypres and Ghent), and was taken prisoner.

"Three Zeppelins appeared during the night over the counties of Suffolk and Essex, alarming the inhabitants and dropping bombs over Lowestoft, Heybridge, Maldon, Southwold, and Burnham, and setting fire to timber yards and houses. A German naval aeroplane visited Sittingbourne and Faversham, dropping bombs. The machine was fired at, but escaped unhurt. A French aviator appeared over Rothweiler yesterday and dropped bombs near a powder factory, doing little damage. The factory was not damaged at all. The aviator was bombarded, but escaped.

"The morning papers all make a feature on their first pages of the reports of the Zeppelin bombardment of the English East Coast. The *Tageszeitung* says: "We greet with satisfaction the rapidly recurring expeditions of our Zeppelins."

In a Turkish *communique* issued on Monday regarding the sinking of the submarine E15, there was the following :—

"When the enemy's air machines learned the fate of the submarine they flew over the straits in search of it and threw bombs on the periscope and conning-tower, fearing that it might fall into the hands of the Turks."

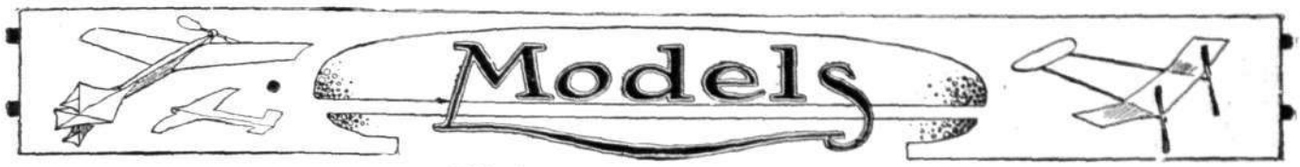
Writing on the 19th the *Morning Post* North of France correspondent said :—

"At all points we have given the Germans a disagreeable taste of our metal. Their attitude is one of depression, and the signs are most promising. Their aeroplanes are busy with the bombardment of open towns, but they are carefully chased away from proximity to our fighting lines by the vigilance of our airmen, which accounts for the fact that we are enabled to make our preparations for the attack of such points as are judged proper without news, or at best only scanty news, of our movements leaking out."

The *Daily Mail* correspondent at Porrentruy (Switzerland), writing on Monday, said :—

"Notwithstanding the fog which prevailed, German aeroplanes yesterday morning flew over Belfort and dropped a number of bombs. A civilian was killed, but little material damage was done.

"The bombs were aimed at the Grandes Usines Alsaciennes factory, but these were not touched."



Edited by V. E. JOHNSON, M.A.

Some Remarks on Steam Plants for Model Aeroplanes.

A successful steam plant for model aeroplanes must possess, amongst other things, great lightness, reliability, simplicity, quickness in starting, a high factor of safety, be easy of control and suitable also to some form of automatic control. The only type of boiler which satisfies such conditions is of a tubular form.

Now this can be made in two distinct forms, the water tube and the fire tube. In the first-named the water passes through the tubes which are surrounded by the products of combustion—whilst in the second it is the products of combustion that pass through tubes surrounded by water. Of the two, the former is to be preferred, owing to its small weight and the ready response which it can be made to give automatically to the demands of the engines—largely due to the very small amount of water in the boiler at any one time. Actual practice in the case of automobile cars has shown that these tubes may be placed in any position—vertical, horizontal, or inclined, or in a spiral or coil form. There is in such a type no necessity to trouble about water circulation, as in the ordinary types of boilers, on account of the infinitesimally small time that it remains in the boiler before it is turned into steam. Such a type of boiler is especially *safe*—even if a tube should burst or split, the escape of steam and water would have practically speaking no harmful effect even in the case of an automobile flash boiler, let alone one fitted on to a small model aeroplane.

A well-known engineer once stated that he was quite prepared to sit on the top of such a boiler while it was being forced to the greatest possible extent—so small did he consider the risk to be. In the flash boiler the water is more or less instantaneously converted into steam by contact with very hot metallic surfaces, the temperature of such surfaces being considerably above that of the steam as first formed. The general direction of the steam and the water through the generator should be the same as the products of combustion, so that the more or less cold water enters the boiler where the temperature is lowest, thereby first coming in contact with the cooler gases, and having its temperature continually raised as it passes through the coils, such an arrangement greatly contributing to the efficiency of heat conversion. Finally, the steam, now superheated, leaves the boiler on its way to the engine. It is well known that when steam is heated in contact with water, *i.e.*, in the steam space of a boiler, its pressure increases with the temperature, and more of the water is evaporated; when, however, steam is heated (so to speak) after having left the boiler and on its way to the engine, its pressure remains the same, but its volume increases. This extra volume passing into the steam cylinder and thus reducing the quantity of steam taken from the boiler. In the early days of superheating, when only animal and vegetable lubricants were used, the rapid deterioration of valve faces, &c., exposed to friction under steam pressure, was so great as soon to lead to the abandonment of such a system, but with the improved lubricants and metallic packings now available these objections no longer hold, especially so in such a case as we are considering, which is only required to run for a short time each trial. Also, to get good results out of high-pressure steam, we must have an engine with high temperature cylinders; strictly speaking we should also have one or more intermediate cylinders and a low temperature part, *i.e.*, the condenser; these latter, however, in the case under consideration, have to be omitted owing to the extra weight they would entail.

The simplicity of such a system is further enhanced by the fact that there is no water level to maintain, and therefore no need of any water gauge or fusible plug, and the consequences of a split tube is no more serious than the opening of a safety valve.

The writer has frequently tested such boilers by making them red hot, in some cases almost white hot, and allowing water under pressure to enter them while in this condition without any damage resulting.

Another advantage arising from such a type of boiler is that no trouble is experienced from the presence in the water supply of such substances as lime, oil, chalk, dirt, &c., owing to the high momentum of the steam being quite sufficient to carry such through in suspension. To get good results a thoroughly efficient mixing of the air and gas or vapour (in this case benzoline) is absolutely necessary. Another very important point is that a fine and accurate control must be effected on both the supply of fuel to the burners and of water to the boiler. Also, the fuel discharge to the burners should be proportioned to the water delivered to the boiler. For instance, any diminution in the supply of water to the boiled at once results in an increase in the temperature of the steam—the fuel flame being supposed constant. Actual experiment has, however, shown that when once the lamp flame is initially correctly adjusted (by means of a needle valve), but little, if any, further adjustment is necessary throughout the trial. The same, however, cannot be said to hold in the case of the water supply. The value of using superheated steam in such a case as this can hardly be overestimated. In the first place, there is the elimination of the loss of heat due to initial condensation on entrance into the cylinder, amounting, as it sometimes does, to as much as 25 per cent. The work done by the steam during the expansion portion of the stroke is performed at the expense of the heat energy of the working fluid, and, in consequence, the temperature of the steam and the inside walls of the cylinder possess the same temperature as the steam, and therefore at the end of the expansion stroke they will have a far lower temperature than that of the initial stroke.

Also the fall of pressure which takes place when the exhaust valve is opened will be accompanied by a fresh fall of temperature, and therefore at the end of the exhaust stroke the entering steam will come into contact with, comparatively speaking, cold walls, and if not superheated to a sufficient extent to raise the temperature of the walls and piston at least to that of dry saturated steam at the same pressure condensation must result.

Re-evaporation of the condensed water during the exhaust also tends to lower the temperature of the cylinder walls. As soon as the steam commences to expand in the cylinders the pressure begins to fall and the water present, having its pressure lowered, begins to evaporate; the amount, however, which is converted into steam is very small. The greater part being either evaporated at the end of the expansion when it is not of much use for doing any useful work, moreover, the evaporation that takes place not only cools the walls of the cylinders, but increases the back pressure upon the piston, thus directly reducing engine power; and in the case we are considering no second cylinder can be employed to in any way compensate this. Again, the actual weight of steam used will of course be increased when actual condensation does take place—if the same position of cut-off be retained, as an increased volume of steam must be admitted to take the place of condensed water. As to the degree of superheat to be used, in the case of automobile practice, some designers only superheat sufficiently to prevent condensation on admission to the cylinders, while others employ a degree of superheat which permits of even the exhaust steam to be superheated.

In the case of a steam plant for (small) model aeroplanes, the degree of superheat which can be employed largely depends, in fact it might be said it entirely depends, on the manner in which the engine is lubricated; experiment has clearly shown that it is not a very difficult matter in a small plant to have an excess of superheat, and that the disadvantages, if the superheating be carried too far, considerably outweigh the advantages.

(*To be continued.*)

Bentwood Propellers. By Wm. P. Dean.

From the *Model Aero* (U.S.A.).

Very effective propellers can be made from thin maple or birch, steam twisted. Models driven by them have gained world's records. They are lighter, stronger, and more powerful than those carved from the solid. The following directions (from long experience and practice) will enable any boy to turn out his own propellers with satisfactory results.

Confine yourself at first to sizes from 6 to 10 ins. (8 ins. is the most popular). Always make two at a time, right- and left-hand or "twins," by so doing you can check the pitch angle of the blades accurately. Note narrow blades with great twist only require a few strands of rubber to drive them, whilst broad blades with coarse pitch might require double the weight of rubber to obtain the requisite 600 to 1,000 revolutions per minute.

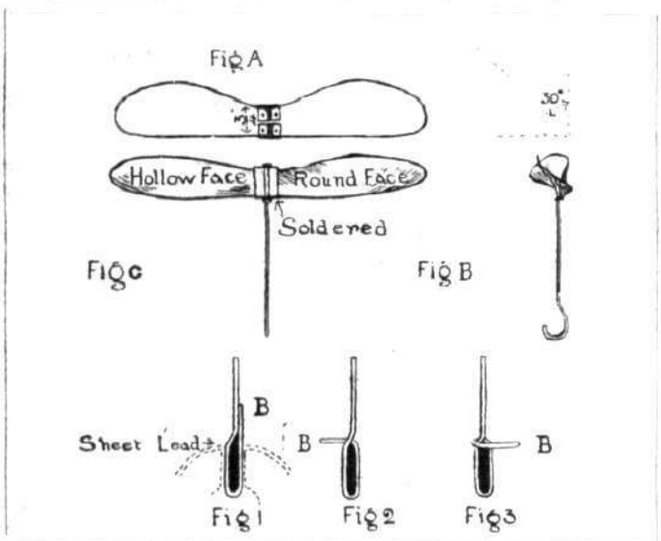
Fig. A shows a very satisfactory shape of blade before twisting.

Fig. B shows end view after twisting, which should be carefully studied during the process. The twin-propeller is twisted in the other direction to that shown. Fig. C finished side view.

The angle of the blade tips should be about 50° with the horizontal as shown.

Select two straight grained pieces of birch 8 ins. long, 1¼ in. wide and barely $\frac{1}{16}$ of an inch thick when planed. Cut out both to the

shape shown at Fig. A. Obtain two pieces of thin tin 1⅝ in. long and ⅝ of an inch wide. Fold these over at the centre as shown, and punch dents. Now cut off two pieces of 1/16 in. diameter mild steel wire or cold drawn brass wire, 6 ins. long for the shafts. First bend as at Fig. 1. Then spring in the propeller blank. Hold in position, preferably between the jaws of a small iron vice, lead clamped, as shown by dotted lines at Fig. 1. Now with pliers pull down end B to right angles. Figs. 2 and 3. Then pull it once



around the shaft, or twice if preferred, cut off end B close to shaft and file off level. Close up with pliers, and run a little solder on each side, which fixes the shafts firm. Cut off the shafts about 2½ ins. from the spiral, this will allow sufficient length to form the rubber hook end at a later stage, before or after being placed in the propeller bearing fixed on machine. To steam twist the blades dip them into hot water and hold over a candle flame or the steam from a kettle spout. Let the heat of the candle affect the hollow side or the steam the rounded side of each blade, hold the blade in the centre with one hand and twist with the other gradually from near the centre to the tip of the blade. The greatest twisting effort is required near the centre. After obtaining about one-half of the desired twist, turn around and work upon the other half of the blade, again studying your end sketch and twisting as before. Now lay this upon one side and go to work upon the other propeller, which must be twisted in the opposite direction (see end view). See that the entering edges of the blades are on the shaft. Having twisted both blades about half the necessary amount, lay them together end to end, and satisfy yourself that they are correct so far, then leave them for a day or two. A second steaming process will complete them; regulate by further steaming any difference detected later in the pitch. When thoroughly dry give three coats of oak or shellac varnish.

[*Re* shellac varnish, we have had considerable experience with this, and cannot recommend it. It is now being given up even in electrical work; it is hygroscopic, and deteriorates in course of time. A bentwood propeller varnished with it would not, in our opinion, retain its shape; a good boat varnish would be much better.]

Canadians Anxious to Join Flying Corps.

ACCORDING to a *Times* correspondent at Toronto there has been a rush of recruits for the Flying Services, a call for which was only given a few days ago. Applications were received from all parts of the Dominions, and a number of Americans also volunteered.

About the Hall Flying School.

A LITTLE *brochure*, giving a brief outline of the history of the Hall Flying School at Hendon, and giving a short explanation of the methods of tuition followed there, has just been issued. It is splendidly illustrated with a number of photographs. Those who are thinking of taking up aviation, and are considering which school to join, would do well to secure a copy. A postcard to the Hall Flying School, The London Aerodrome, Hendon, N.W., will bring one by return.

How to Know German Aircraft.

THE publicity matter of the General Electric Co. is always smart and up to date, and one of the best examples is a little pamphlet which has just been got out in the interests of the "Freezor" electric fans. Two pages are devoted to illustrations and notes on the airships and aeroplanes of Great Britain and Germany. The silhouettes are accurately drawn and should prove useful as a guide in distinguishing friendly from hostile aircraft. Doubtless any of our readers could obtain a copy by applying to the General Electric Co., Ltd., 67, Queen Victoria Street, London, E.C.

THE AERONAUTICAL SOCIETY OF GREAT BRITAIN.

Official Notices.

NOTICE is hereby given that the annual general meeting of the Aeronautical Society of Great Britain will be held on Thursday, May 20th, 1915, at 7.45 p.m., at the Royal Society of Arts, John Street, Adelphi, W.C.

AGENDA.

To receive and approve the Report of the Council on the state of the Society, and the balance sheet of Aerial Science, Limited.

To discuss and determine such questions as may be proposed by the voters relating to the affairs of the Society, and to fill the vacancies on the Council for the ensuing year. Any voter desirous of proposing any subject for discussion at the annual general meeting shall give notice in writing to the Secretary, which shall be received by him by noon on May 6th, 1915.

The retiring Members of Council are:—A. E. Berriman, Griffith Brewer, Alec Ogilvie, Squadron Commander; Mervyn O'Gorman, C.B.; F. Handley Page, Col. H. E. Rawson, C.B.; Dr. A. P. Thurston, Eng.-Lieut. G. Aldwell, R.N., who are eligible for re-election.

Nominations of candidates for election to the Council shall be signed by the voters proposing them (two voters and no more), and must be received by the Secretary by noon on April 29th, 1915, with an intimation in writing by the voters nominated that they are willing to serve.

An amendment to Rule 11 will be proposed by the Council to the effect that in cases where no new nominations for the Council are received a ballot paper need not be posted, the retiring Members of Council being re-elected at the Annual General Meeting.

The Council will also ask for approval of their action in postponing, on account of the war, the date of the Annual General Meeting.

By order of the Council,
BERTRAM G. COOPER, Secretary.

11, Adam Street, Adelphi, London, W.C., April 19th, 1915.

PUBLICATIONS RECEIVED.

The Zeppelin Raid in West Norfolk. By Holvombe Ingleby, M.P. London: Edward Arnold, 41–43, Maddox Street, W. Price 3*d.* net.

Catalogues.

Oxygen and Other Gases for Industrial and Medical Purposes, Gas Regulators, Blow-pipes, Metal Cutters, &c. The British Oxygen Co., Ltd., Elverton Street, Westminster, S.W.

Steel Wires for Hardening and Tempering. W. N. Brunton and Son, Musselburgh, Scotland.

Aeronautical Patents Published.

Applied for in 1914.

Published April 22nd, 1915.

8,598. A. CLEMENT-BAYARD. Transmission gears for controlling aircraft.

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